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EDITORIAL NOTES—GAS, &c.

Engineering and the Workman.

WE are living in times pregnant with significance in respect of labour and the future welfare of industry. In our Legislature, Socialism has planted itself for the first time with strong root; the recent Trade Unions Congress has vividly revealed the influence it exerts in the newer of the Unions and its entrance into the counsels of the older and more soberly conditioned ones; the Daily Press—the mirror of the course of national, social, and commercial movements—has given it space and consideration; and even "The Times" has devoted columns to correspondence on the subject initiated by Sir George Livesey. No one can avoid paying attention to it. Socialism is a hydra-headed monster; and its mischievous teachings and influences have to be attacked from many sides. There is, however, only one direction in which we desire, on this occasion, to give to it a little consideration, to indicate how conception and thought on the part of the apostles of Socialism are at fault, and how, if it were possible for Socialism to prevail against the forces of human and economic progress, industry would have a sharp set-back, and instead of the betterment of the people—the goal, by way of mistaken routes, of socialistic ambition—their condition would be worsened.

It is of the creed of the Socialist, as stated at the recent Trade Union Congress, that the unemployed "partly owe "their position to Science, with all other easy methods of pro- "duction, being used to benefit the few against the interests "of the many." This supplies an excellent starting-point to a brief consideration of the question from the one standpoint. It is a text upon which, if space could be devoted to it in a technical journal, a great deal could be said. But it has its technical bearings. "Science with all the other easy "means of production ——" There is no one who has done more to apply Science in furnishing "easy means of "production" than the engineer. At the opening of the Engineering and Machinery Exhibition, Sir William White was responsible for the utterance of a greater truth than that heard at the Trade Union Congress, that "the true "engineer lives not by the expenditure he can influence, "but by the savings he can effect." This truth is painted in striking colours throughout the course of human and economic progress during the past century. The special point is, however, in the face of the declaration at the Trade Union Congress, to show that engineering and mechanical progress has benefited—has been in the interests of—not the few, but the many.

Herr von Oechelhaeuser recently delivered before the Society of German Engineers an address that is pertinent to the subject in hand. The composition commands attention and respect for its thoughtful, its erudite and far-reaching, characteristics. Though it is not the object of Herr von Oechelhaeuser, the narrowness of the view of Socialism, within the limit we have set ourselves in this article, can be exposed by comparison. He pictures the accomplishments of the engineer and technologist from deep down in the past to modern times, to show how they have conduced to the well-being of the workers. In pre-mechanical days, gigantic engineering and architectural work could only be performed by a multitude of workers. The pace was slow; and it exemplified well the rate of economic progress, and of the improvement of the conditions of labour. But in the last century mechanical appliances were in almost every industry brought to bear in the relief of human physical effort; and difficult and laborious work has in almost all employments been replaced by machine tools. Says Herr Oechelhaeuser:

> In such work as cannot be wholly performed mechanically, the human portion has been limited to guidance and control, leaving the effort to be done by power. In like manner, the mechanical forces of Nature have been placed under control; and improved motors of many kinds have been devised to place natural forces under the control of man. With this control of power, there has come a far more efficient utilization of materials than formerly, besides which bye-products are employed which previously went to waste. Especially noteworthy has been the improvement in quality, and marvellous reduction in cost, attained by mass production, involving the development of automatic machinery and repetitive processes.

In this terse and suggestive statement, is seen the evolution from simple to more complex conditions; and that has meant the evolution of work for man. The supply of labour has developed; the wants of the great and ever-increasing population—a population which has increased in the United Kingdom from under 21 millions in 1821 to over 43 millions in 1905—have also developed. Engineering progress has extended the scope for labour, and assisted to meet the wants of the population on increasingly economic bases.

The Socialists assert that Science and easy methods of production are benefiting the few against the interests of the many. It is a baseless assertion, invented to increase the strain of the relations between (properly reversing in this connection the generally stated order) Labour and Capital. We have only to look to the gas industry for illustration of how engineering has developed the scope for labour, not only by opening up fresh and more endurable kinds of labour within the industry itself, but by the increased labour it has given to other industries. The subject, however, is one to which it is best to give general consideration. What applies to the gas industry applies to all others. What was once done by hand is now accomplished by machinery under human control. There the socialistic Trade Unionist stops short without inquiring into any other effects. The making of the machine has given labour in many industries from the winning of the coal and ore to the beautifully perfect machine. The machine cheapens output, and its less costly product creates extended custom and gives work among the ever-enlarging population. If labour has in any one industry been lessened, it has only been shifted into new ones, which the lessening of the labour has produced. The reduction of labour in one direction results in an accession in another. It is always, in this connection, evolution to the common benefit of mankind. When the Socialist complains of the application of machinery, he does not make a point of the fact that among the Unions succeeding that of the coal miners in numerical strength is the Amalgamated Society of Engineers with probably now some 85,000 members. Without engineering and mechanical progress, in what employment would the greater part of these artizans be engaged? The mechanical industries of this country are greater and stronger than ever they were; and if it were not so, this country industrially would soon be captive to other nations.

Herr Oechelhaeuser, in the passage quoted above, calls attention to the improvement in quality of products through mechanical aid, and the coincident reduction in the cost of production, which has cheapened them to the consumer and brought improved necessities, comforts, and conveniences within the reach of the masses. In addition to these things, mechanical progress has elevated, and not degraded, the workman himself. The man who makes and controls machines is superior to the old hand worker. The man who works the power retort-charging machine is superior to the old shovel stoker; the increasing labour required in the gas distribution department, in fitting up houses for the utilization of gas, and in many other directions, gives responsible employment of an order that raises the status of men formerly engaged in certain arduous manual operations on a gas-works that are now performed by mechanical means, which, in their turn, develop the intelligence and skill of the attendants. Yet—and it cannot be emphasized too often—the Socialist preaches of these easier methods of production being used for the benefit of the few against the interests of the many! The Socialist wars really against capitalists of all degrees—against associated capital, without which engineering and mechanical development could not have been

brought to bear, with such great effect, upon human and economic progress. The continuance of the system of subdivided capital would, in the greatest of our industries, have retarded progress and benefit. It is these things that must be made plain to the people and to the workers in our industries. If the words of the Socialist became the directing law, there would be retrogression and not progress in industry, and similarly in human prosperity and happiness.

Vertical Retorts under Further Discussion.

THE paper which Dr. Bueb read at the recent meeting of the German Association, on his valuable special carbonization experiments with vertical retorts at Dessau, was productive of a discussion that was as light-yielding as the contribution itself; and, perhaps, from the gas engineer's and gas maker's points of view, more so. Practically a verbatim translation of the report (for which we are indebted to our German contemporary) is published in this issue; and it will be seen that it brought views from several eminent workers in the field of carbonization. While, however, all their contributions were most interesting and instructive, they have not brought us any nearer the elucidating points of the several fresh problems that carbonization in vertical retorts has called to the surface. The Dessau system has to justify itself first and foremost as a gas producer to which upon all sides the financial test can be applied, in comparison with existing systems. A balance-sheet of the Dessau vertical retort working with an analysis of the items —from initial cost to final result, including a liberal consideration for progressive depreciation—should not now be beyond scrutiny, in view of the fact that in July last there had been more than a full year's working. That the attainment of higher gas yields has been the latest direction in which work has proceeded at Dessau, is seen by tracing the published history of the twelve months, which started with a gas make of from 11,124 to 11,842 cubic feet, and ends in the latest returns at 12,560 cubic feet. A remark recently made in these columns, in a reference to the German Association meeting, may be here repeated, that it looks as though economy of carbonization fuel is, with the Dessau retort, being sacrificed to the fetish of high makes. Fuel consumption has been progressive, and is higher than ever. For with the somewhat lower yields reported twelve months ago, the fuel was equal to 14 per cent. of the weight of the coal carbonized, and is now 16 per cent., which cuts a very sorry figure for economy in comparison with modern horizontal working. Nor is there anything apparent which gives really substantial hope of a reduction of more than a suggested 2 per cent., by the savings to be effected by the juxtaposition of further retorts. While fuel has gone upwards, the calorific power of the gas has also been sliding backwards; and whereas 573 to 607 B.Th.U. were named twelve months since as the calorific value of the gas, 562 B.Th.U. gross is the quoted value of the higher yield of gas to-day. Nothing much in the way of criticism can be made of this in view of the greater production of gas, which, on the other hand, has not anything much to boast of in the way of illuminating power—of course, bearing in mind the character of the coal used.

However, all the new experience at Dessau and Mariendorf that Dr. Bueb and Herr E. Körting respectively advance from time to time has a fascination throughout the gas-making world. Direct from the meeting of the Institution of Gas Engineers, Herr Körting, in taking part in this discussion before the German Association, acknowledged the warmth of the reception that he had received in England, which warmth his own personality could not fail to encourage. He also enlightened his German colleagues as to the trend of technical view and aspiration in this country in connection with vertical retort working. The paper also gave an opportunity to Dr. Bunte, while not accepting all explanations as to the causes of certain effects in the Dessau system, for generally endorsing the lines of operation. One of the most important contributions to the discussion was made by Herr Klönne; and though the weight of his remarks may be discounted by the application of the term "theoretical," Herr Klönne's extensive practical experience in carbonizing plant gives a large measure of value to his opinions, and commands for them respect. Herr Klönne attacks the vertical retort structure from the life aspect; but one can only now deal with his views without complete time-experience to verify or negative. In a word, his belief is that the vertical retort has to bear much greater stresses than the horizontal; and that the stresses are greatest at the bottom, where the temperature is the highest. When the Dessau system leaves its nurseries at Dessau and Mariendorf, where it has received such very careful tending, and gets exposed to the austerities of everyday working elsewhere, the lifetime, Herr Klönne believes, will be much shorter than the ardent hopefulness of the Dessau workers has induced them to expect. The horizontal retort is not going to stand still in development; and on this and the preceding grounds, Herr Klönne confidently says that the horizontal retort will still retain the premier position. Being a cognate subject, Herr Ries introduced into the discussion some experiences with the use of coke-ovens in gas-works. But that is another and a big subject; and it appears to possess a certain charm for Herr Ries on account of its labour-saving possibilities. The gas maker has, however, more than that one end to work for; and before a verdict of constructive development can be passed on a system, the whole of the other ends must be gathered, and be duly examined.

Herr Bueb now counsels gas undertakings with outputs of less than 100 to 150 million cubic feet of gas to wait before making installations of the vertical retort until more experience has been gained. That has been the attitude the "JOURNAL" has consistently taken in this matter; and on this account alone, we are glad Dr. Bueb has so advised. And, moreover, although he twits British gas engineers with going straight ahead for continuous carbonization, instead of proceeding step by step, we certainly have a fancy for seeing the work that is being done here being allowed the privilege of fairly proving itself, before it is positively asserted that Dessau has said the last word on the question, and has proved the hollowness of all possibilities that have presented themselves in other quarters. Dr. Bueb, of course, does not go so far as this. We are thinking that many other undertakings, besides those with an output of less than 100 or 150 million cubic feet, will accept his prudently offered advice.

Carbonization in Horizontal Retorts.

CERTAIN operations of industry appear to be largely subject to periodic attack, rather than continuous endeavour, with the object of attaining improvement in result. Glancing over several years past, it is seen to be so in connection with the chief operation of a gas-works—carbonization. For some time now we have had attention riveted on the efforts associated with the vertical retort system; for a considerable anterior period the inclined retort was claiming attention; and before that (as now) the horizontal system was much as it had been for a considerable period, with the exception of the improvement in the settings and furnaces. There were isolated attempts to carbonize coal in horizontal retorts of smaller sectional area than customary; but it was found that what was gained on the one hand was lost on the other—the expense of the additional labour required to deal with these retorts being a loss which was not compensated for by the gains. In these references to improvement, or rather attempted improvement, in the horizontal system, the auxiliary plant in which, of course, advance has been very marked, is not being taken into consideration. It is the horizontal retort itself which seems to be just now receiving renewed attention—both in regard to its form of construction, and in its manner of setting.

In the current volume of the "JOURNAL," studious readers will have observed certain communications from abroad on the subject; and in the present issue there are articles alluding to the setting of retorts and to an investigation into carbonization by slowly increasing temperatures. The shape and build of horizontal retorts received a couple of exceedingly interesting contributions in our issue for July 17 —one coming from America and the other from Germany. While their sources were so distant apart, they bore some relationship, in that the proposal contained in the latter has for one of its purposes the remedying of a by no means newly discovered evil that the author of the American contribution (Mr. W. E. Hartman) pointed out. The investigations of Mr. Hartman into the factors that influence carbonization, has brought him to the conclusion that the present pattern retort is not adapted for making gas of the best quality with carbonization carried on at high temperatures—more heat entering the upper part of the retort than is needed to properly fix the gas. A great deal was heard, at the last Institution meeting, about the advantage of a modified temperature at the upper part of a vertical retort; and Mr. Hartman's experiments carry confirmation of the benefit in the

case of horizontals. The question arises how best to reduce the amount of heat the issuing gas comes into contact with at the top of the horizontal retort. Mr. Hartman advocates the insulating of the upper part of the retorts. The lessened deterioration of the resulting gas appears to be the only advantage that Mr. Hartman is likely to secure; and it is a moot question whether the added cost of construction would be justified by the result. Herr Oppermann, on the other hand, it was seen in the same issue, is of opinion that the like result can be obtained by reducing the area of the vacant wall in the retort with which the gas would come into contact in its travel to the ascension-pipes. This he believes can be secured by altering the shape of the retort; and there will also be collateral valuable advantages. Briefly, his plan is that the present or other shape retort should be deposed in favour of an elliptical or rather egg-shaped cross-section retort. The use of the elliptical retort is, of course, nearly as old as any other shape; for in the early years of gas manufacture, Malam proposed it for the purpose of getting a thin stratum of coal, by making the long sides of the oval the floor and roof respectively of the retort. The oval retort so placed, however, gives a large amount of top heated surface against which the issuing gas comes into contact. But it is by the mere inversion of the manner of setting that Herr Oppermann hopes to secure advantages. He has suggested the setting of the retort so that the ellipse is disposed vertically with the large end of the egg at the bottom. By so placing the retorts, Herr Oppermann claims several gains: At least four-fifths of the internal surface of the retort is engaged in the carbonization of coal, so that there is a smaller free surface to act prejudicially upon the gas; 50 per cent. more coal can be carbonized in the retorts; and the make of gas is greater per unit of ground surface. We are a little sceptical as to whether these retorts will be as amenable to mechanical charging and discharging as the ⌂ shape retort. But as the plan is all on paper at present—and is therefore inconclusive and lacks the practical trial to commend the results as acceptable—the proposition can only be regarded with an interest heightened by the completeness of the virtues which Herr Oppermann believes his project to possess.

In the current issue, an article by Mr. Frederick Egner describes another German innovation which, by the system of constructing and setting, claims to have reduced the liability of horizontal retorts to cracking. Though not bearing directly on the subject of horizontal retort improvement, we are also publishing a translation of an account of experiments by Dr. Börnstein, of Charlottenburg, on the "Decomposition of Solid Fuels by Slowly Raised Tempera-"tures." As the apparatus and methods employed in these experiments bear no resemblance to gas-works practice, we fear they will only have an academic interest for the few. There is no doubt the author has taken a vast amount of pains in pursuing his investigations; but the useful purpose served by research carried out under these conditions will perhaps be more apparent with the passing of time than it is at present.

A Standard of Illumination for Street Lighting.

A DISCUSSION in the Daily Press as to the relative merits of gas and electricity for street lighting, by those who understand what they are writing about, may be advantageous in priming the public with elementary knowledge of the subject which will enable them to take an intelligent interest in it, and weigh the respective claims of the rivals. For after all, the elected representatives of the public, and not the experts, have the final word in adoption. But we are not convinced, by what has been happening in the Engineering Supplement of "The Times" recently, that the comments of their distinctly prejudiced "Note" writer has done anything but add confusion to the subject-matter of an otherwise useful correspondence. Attention has been called to these comments in the last two issues of the "JOURNAL;" and it has been clearly shown that their author is ill-informed upon this question, of which he professes knowledge.

In the last issue of the Supplement, the penman of the "Notes" has something to say about photometry, and urges that what is really needful is that the experts should agree upon "some uniform standard, and that we should have "definite and scientific estimates of results for the guidance "and information of the public. This subject of lighting "is one," he adds, "which should be settled by reliable and "accurate observations, and not by mere prejudice and "opinion." Here we have a sufficient indication that he does not understand that the individual characteristics of our public highways and by-ways cause such complexity of condition that a "uniform standard" and street lighting have very little in common. One street may be wide, and bounded by trees; another may be narrow and bounded by buildings with good reflecting surfaces; another may have variegated architecture with no general allignment of the buildings; and yet another may have numerous by-streets with sharp turnings on both sides. A thousand-and-one conditions come in to mock the idealist's fancy for committing street lighting to some form of standardization. Every form of lamp must be the subject of special consideration, and every street the subject of special treatment.

Photometrical tests of lamps—gas or electric—for street lighting are comparatively worthless, seeing that a photometrical reading does not afford any criterion of useful effect when a lamp is employed in the open. In the same issue of the supplement, Sir George Livesey points out that such tests "can "only indicate the power of the individual points of light, "and for street lighting this is quite useless. . . . The "real test for such lighting is not photometric, but some-"thing far more practical—to wit, the eyesight and the "common sense of the man in the street." The flame-arc lamp may have photometrically a higher illuminating power than (say) a 600-candle power high-pressure gas-lamp; but the lower nominal illuminating value of the latter is the more valuable, on account of its distributive power, than is the congested wealth of illumination—fluctuating and eye-irritating—of the flame arc lamp. Sir George is right. If the public will recognize that half-a-dozen yards or so of great brilliance in the roadway round about a lamp column as produced by the expensive flame arc is not profitable and effective illumination, and will set their minds upon looking for a fair amount of uniformity of lighting along the street surfaces, and compare the cost of this uniform lighting with the studies in light and shade that electricity gives them at a greater price, there can be no question (without the aid of the suggested "definite and scientific estimates," which the man in the street would not understand) as to which way the public verdict would go. The practical man considers the value he can get for his money. He likes evenness of quality, and does not want to pay more for it than necessity and efficiency compel.

Coal Prices and Coal Over-Production.

If any further justification were required for the action taken in resisting higher prices for coal, it would be found in some remarks made last week by Mr. A. M. Henshaw, Ex-President of the North Staffordshire Mining Institute, at the conference of Mining Engineers of Great Britain at Stoke. He asserts that the coal trade is suffering from over-production, and that this is a very serious matter. In the boom of 1900, when every colliery in the country produced every ton it could, the total output was 225 million tons. Last year, although the average number of days worked each week at the collieries was about four instead of six, the increase in production as compared with 1900 was 11 million tons. This year the output will probably be not far short of 250 million tons, although the average time worked by the collieries of the United Kingdom will not be more than five days a week. The cause of this over-production Mr. Henshaw attributes to the fascination coal-mining possesses for the average Englishman. The over-production, he says, follows naturally on the booming times of 1900; and in the immediate future he is afraid a slump will be experienced similar to that which followed the boom of 1872. The owners are threatened with an increase of wages; and Mr. Henshaw is sorry that one of the reasons given for the demand for an increased wage is that the coal tax is to be taken off. Colliery owners will not, he asserts, get the benefit of the cessation of this tax. The consumer will be the beneficiary.

Spent Ammoniacal Liquor Purification.

Exactly two years ago, the Waltham Abbey and Cheshunt District Gas Company were compelled by the Cheshunt District Council to cease working their sulphate plant, on account of injury done to the bacteria beds of their sewage works by the ammonia

effluent sent into the sewers. Since that time, the sulphate plant has stood idle; and the ammoniacal liquor has been sold as such at a substantial loss of revenue on that account, without considering the unremunerative capital on the plant. It is satisfactory to learn from the proceedings at the recent half-yearly meeting of the Company, that the Chairman (Mr. Alfred Kitt) was enabled to announce, in addition to good progressive results and the maintenance of the dividend in spite of the increased cost of coal, that "the new process for treating the waste liquor from the sulphate of ammonia plant is now completed, and has shown good results when working. The treated liquor is almost as clear as drinking water." We understand that, at the instance of W. Bince Randall, the Engineer, the purification plant was started three months ago; the District Council being duly notified of the discharge of the effluent into the sewers. No complaint has since been made. Owing to the high retort temperatures reached at the Company's works, the ammonia effluent is a particularly bad one, containing as much as 0·7 per cent. of ammonium sulphocyanide. This is another instance of a gas-works which has been able to avoid nuisance and loss of money by the use of the patent process of Mr. J. Radcliffe, of East Barnet, which has been explained in previous issues of the "JOURNAL." We are hoping shortly to publish some bacteriological tests, showing that this purified effluent improves the working of bacteria beds in cases where the crude effluent has destroyed them. But meantime the additional testimony from the working at Waltham Abbey is of interest, as confirming experience in other quarters.

Fair Wages and a Coke Contract.

Local government is now carried on largely in obedience to despotic Trade Union rules and demands. Among other things, it is rather a sorry spectacle to see one local authority after another, whose power and dignity have been the admiration of the many, suddenly succumb to the Trade Union demand for the insertion in municipal tender advertisements and contracts of the Trade Union wages clause. The result may be to the injury of the public purse, without in any way ensuring any better price being paid by the contractor for the labour involved. A case in point recently arose in the Preston Town Council; and from the short discussion, it appears that the Committee concerned had had to choose between an unnecessary (in the circumstances) compliance with the rule as to the appearance in a contract of the fair-wages clause, or the payment of a higher price for the fuel required. For the sake of a strict observance of a principle, Mr. Woolley, a member of the Council, would have preferred that the ratepayers' money should be wasted, and a higher price be paid. The contract was for coke with the Preston Gas Company, who, though they pay the usual wages, had objected to sign the contract with the clause in question in it. The Company were quite willing that the contract should be cancelled if at any time it was found they were not paying fair wages. The Committee were satisfied with the contract, money was saved, and the Council ratified the agreement. Then came the attempt to upset it, and Mr. Woolley's protest in the Council. But it had no effect. These sticklers for labour's full pound of flesh, with as much over as possible, are generally found to be the people who are mainly responsible for extravagance in local government. And it would have been an extravagance to have paid more for coke for fuel than duty or fairness to labour demanded. We are glad to see the Preston Council had the good sense to stand firm against an unnecessary insistence on a stupid form.

Trade Unionism and Liberty.

The recent strenuous efforts that have been witnessed in the South Wales coal-fields to force non-Unionists to join the ranks of the Miners' Federation, have naturally attracted widespread attention to one of the least pleasing aspects of Trade Unionism. To compel a man to join a Union is to rob him of that personal freedom of action which—erroneously, as it would now appear—we are in the habit of regarding as the special prerogative of Britons. But however distasteful may be this interference with the liberty of the subject, it is easy enough to understand the necessity for the Unions, if they are to wield any power at all, to leave as few as possible outside the fold. Any pressure which Trade Unionists may bring to bear upon unwilling men to make them become members of their society, though, of course, not justifiable, is dictated by the instincts of self-preservation. But it is impossible to advance even this excuse when outside bodies resort to compelling their employees to become Unionists. A case which is within the last-named category comes from Llanelly, whose Urban District Council have decided, at the bidding of the local Trades and Labour Council, that "all the employees of the Council must become members of their respective Trade Societies; and that the Council shall not consider any applications for future vacancies unless candidates are members of some Trades Union." Of course, employers are perfectly free to say that they will engage only Unionists or non-Unionists; but the Llanelly Urban District Council go much farther than this. Out of the 81 men in their service, it is stated that there are 28 who are not members of a Union. Now these latter, though it cannot be said that they are literally being compelled to become Unionists, are having a pretty strong form of "persuasion" applied to them. Evidently there are to be no half-measures here; for on the Clerk to the Council asking whether it was intended that he should join a Trades Union, one of the members promptly answered "Yes." Another seeker after information was the Chairman, who wished to know whether such a resolution had been passed by any other public body. No one was able to furnish him with an instance; but apparently Llanelly did not fear to lead, as the motion was carried by six votes to four—one member remaining neutral, and eight being absent. Thus have the Trade Unionists induced the Urban District Council to actively aid the endeavour to increase their membership.

Lively Town Council Proceedings.

The Glasgow Corporation were kept busily occupied at their meeting last week by discussions which arose out of questions asked by Mr. Scott Gibson. The first of these had reference to the alleged employment on private work of men in the service of the Parks Committee; and the second (which is alluded to by our Scotch correspondent in his "Notes" on another page) dealt with a matter that is at present engaging attention elsewhere—namely, alleged illegal trading by councillors. This, however, by no means exhausted the list; and the next topic touched upon by Mr. Gibson was the familiar one of banquets. From this he went on to more personal matters—in fact, the Lord Provost and Town Clerk for some time declined to read the questions. However, several members expressed the opinion that they should be read; and ultimately one or two more were dealt with. One of them at any rate turned out to be of an extraordinary character; and it again proved too much for the Lord Provost, who asked the Town Clerk not to read any more of the questions that day. Mr. Gibson, however, was not to be so easily quieted; and he made strenuous efforts to get the next question read, and failing this to read it himself. But when just on the point of doing so, another member left his seat, and walking up to Mr. Gibson, snatched from his hand the paper containing the question, and threw it in the fireplace, amid laughter and applause. Nothing daunted, Mr. Gibson proceeded to put his question "from memory," when it transpired that he was anxious to know whether on a particular occasion recently a member of the Council was "dragged out of his bed at midnight, and subjected to a mock baptism by certain individuals pouring Scotch whisky all over him." While this had been going on, Mr. Gibson's suspension was moved and seconded; but after repeated requests by the Lord Provost, he resumed his seat, with the promise to put more questions at the next meeting. The incident closed with a declaration by the Town Clerk that he knew nothing about the last question, and that it had nothing whatever to do with the business of the Town Council or with anything that had ever come under his notice. One can but regret, not only that such a scene as took place at Glasgow last week should happen, but that it should be possible for it to happen.

The North of England Gas Managers' Association will meet on Saturday week, the 6th prox., in the Lecture Theatre of the North of England Institute of Mining and Mechanical Engineers, at Newcastle. The *agenda* is not a long one, consisting as it does of the election of new members, the delivery of his Inaugural Address by the President (Mr. T. Hardie, of Gateshead), and "other business." Subsequently, on the invitation of the Chairman and Directors of the Newcastle-upon-Tyne and Gateshead Gas Company, the members will dine at the Royal Turk's Head Hotel; and this will be followed by a steamboat excursion to Tynemouth, returning by train to Newcastle.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 854.)

LAST week, as in the week before, the Stock Exchange was almost wholly dominated by the Money Market, with the result that business was, to a great extent, pretty well paralyzed. Monetary movements were anxiously watched, and extreme caution observed against commitments on any large scale. Other factors which helped to keep things quiet and flat were the Jewish New Year holidays, the Grantham accident, and the fear of labour troubles in home railways. But money was the leading factor. The first incident was the raising of the German Bank rate, which gave another turn to the screw in Lombard Street. The demand, chiefly for America, grew so strong that a raising of the Bank of England rate to 5 per cent. on Thursday was in some quarters thought inevitable. Happily, the Directors found a solution of the difficulty by advancing the rate against outsiders, while maintaining it at 4 per cent. for their own customers. However, the Gas Market did not suffer any malign influence, but on the contrary was fairly active and generally firm. Changes in quotation were few and slight. They included one or two retrograde movements; but these did not give the tone to the market. In Gas-light and Coke issues, the ordinary was in good demand; and the quotation advanced half-a-point. The figures at which stock changed hands ranged from 99⅝ to 100¼. Very little business was marked in the secured issues; and they made no move. The maximum was done at 88½ and 89½; the preference at 109¼; and the debenture at 87. In South Metropolitan there was rather more than usual done, and prices were close; never ranging outside the limits of 133 to 134. The debenture changed hands at 86 and 86⅜. Commercial was very quiet—business being limited to a couple of bargains in the 3½ per cent. at 110½ and 111; while the 4 per cent. and the debenture were not touched. The Suburban and Provincial group were as quiet as usual, and perhaps a little more so. British was marked at 41¾, South Suburban at 125, Tottenham "B" at 102, North Middlesex at 20⅛, West Ham ordinary at 105¾, and ditto debenture at 104 and 104½. In their local Exchanges, Sheffields showed an advauce of 2 on *ex div.* variations; but Liverpool "B" fell back a point. In the Continental companies, Imperial was quiet and easier; transactions declining from 189½ to 187½ (with a fall of 2 in the quotation). The debenture changed hands at 96¼. Union was done at 125 and 125¾, and European fully-paid at 24⅜. Tuscan shares advanced ¼, and the debentures 3½. Among undertakings of the remoter world, Buenos Ayres changed hands at from 12½ to 12⅝, Monte Video at 11⅞ and 12 (a rise of ½ in the quotation), Primitiva ordinary at from 6⅞ to 7 1/16, ditto debenture at 97¼, River Plate at from 13 to 13¼, ditto debenture at 97, and Cape Town at 15.

The closing prices are shown in our Stock and Share List on page 854.

ELECTRIC LIGHTING MEMORANDA.

More Exposure of Municipal Muddling and Crooked Accountancy—West Ham Disclosures—Camberwell Ratepayers and Ambitious Councillors—The Opening of Roads in London—Danger in the Flat Iron—The Preferences of Metallic Filament Lamps.

THE Local Government Board, through their Inspectors, are continuing the campaign against the pseudo-financial methods of the electricity departments of municipal corporations; and local authorities large and small are finding that slipshod accountancy and improper shelving of financial responsibilities will not do for the Board. This is very satisfactory; and the Committee appointed by Mr. John Burns to consider the account systems of local authorities will not surely have any difficulty in coming to the conclusion that systems allowing of so much financial shuffling are not safe or correct in the public interest. Only lately electric lighting inquiries have had to be postponed at West Ham, Bristol, Brighton, Walthamstow, and Dudley, for the sole reason that there was such a tangle in the electricity accounts that it was impossible to unravel them at one sitting. Looking farther back, these towns do not exhaust the list. Excess capital expenditure, wrongful application of loans, unrepresented capital, and, in fact, a fairly all-round illegitimate mode of dealing with finance, have been drawn from their several hiding-places. The greatest trouble of all has been the difficulty of persevering inspectors—and especially of Mr. H. Ross Hooper, who is particularly keen in detecting the transgressions of electricity departments, and painstaking in getting to the bottom of things—in obtaining from corporation officials definite figures, dates, and so forth. Anything, in their opinion, will do for the Local Government Board; but for the Board to endorse that opinion would simply be to condone iniquities, and to grant that their inquiries are purely farcical. Dudley, Mr. Hooper had to visit three times; and on each occasion, he complained that he received different figures as to the amount of the excess of expenditure on the second loan of the undertaking. He also found that money that had been borrowed for one purpose, had been applied to another. At Exeter, the Corporation recently asked for permission to borrow £2600 excess expenditure; but some awkward questions of account arising, it was deemed prudent to temporarily withdraw the application. At Walthamstow it was discovered that £1110 had been expended on motors for hiring-out purposes, without the sanction of the Board, although the Council have no power to let motors out on hire. The Board were then asked to sanction a loan of £3000 for the provision of motors. They refused; and so the Council simply debited the expenditure to a loan of £5000 received for free-wiring. What are the Board to do with such contumacious authorities? It is a rotten system that gives room for this kind of thing.

One of the most astounding cases of financial muddle that has been revealed is in connection with the West Ham Electricity Department. Reviewing the annual accounts of the undertaking the other week, one of our electrical contemporaries said they indicated that the undertaking was "emerging from the dark days of high costs and deficits." Many such coats of whitewash will be needed before the West Ham ratepayers, after the recent revelations, will entertain any confidence whatever in the truthfulness of the accounts of the department. We cannot go minutely into the medley of despicable maladministration and hoodwinking of the ratepayers that there has been in this East-end borough; but put as briefly as possible, the story is this: The Local Government Board were asked to grant a loan of £75,651, of which the not insignificant sum of £17,634 was in respect of excess expenditure. The Engineer (Mr .A. H. Seabrook) is also forced to admit that the plant is at least 20 per cent. below its computed capacity; and that the condition of the generating-station is notorious in the electrical world. An excess of nearly £18,000 is not an insignificant matter; and the greater part of this is for work found necessary but not anticipated. Electrical engineers were long since distinguished for underestimating expenditure requirements; and they certainly do not mend with time in this regard. On the old works there is still a debt of £4307 for buildings now demolished and machinery that has been running since 1898; and for the expenditure there has been no sanction, and no sinking fund set aside. The expenditure should have been written off at least four years ago; but this was not done. Of the unsanctioned excess on the new station at Canning Town, £10,759 has been spent on buildings, and £4000 on machinery; but with regard to the £10,759, it is questionable how far the Council can apply for a loan in respect of it, seeing that it is said to refer to buildings which are now superseded. There is also another expenditure of £2947 on public lighting which has not been sanctioned. Money is included in the present application that has already been sanctioned for the very purposes for which it is now being required. Money borrowed for one purpose has been spent for others. Capital remains undischarged on subjects that have no present being; and no depreciation fund has been provided. The net deficiency on the undertaking has been £7200. There is much that is of a negative quantity about the finances of the undertaking. It is asserted that there was a net profit made on last year's working of £2523. What nonsense to talk of net profit under the scandalous condition of the affairs of the department. And this is municipal management of a highly technical business! Mr. Seabrook has no doubt been very busy over this inquiry, and may not have had time to attend to his editorial duties in connection with the West Ham "Electrical Bulletin." Suitable and readily available matter for the next edition would be clippings from the report of the inquiry setting forth the financial delinquencies of the department, and the utter helplessness of the officials over the searching interrogations of the Inspector. It would have been grotesque, if the whole situation had not been enveloped in so much that is serious.

With municipal management of electricity supply so much discredited, it is not a matter for wonder that there have been some rather merry doings in Camberwell over a proposal of the Borough Council to go in for the electric supply business, the prospects of which are not what would be called brilliant with 2s. gas on tap in every street, and the competition to meet of the London Electric Supply Corporation, who already have powers of supply within the borough. To sink thousands upon thousands of pounds in a competitive scheme would be the height of speculative folly. With cheap gas impeding, the municipal installation would not make much headway; and the prospect of extracting custom from the present connections of the Electric Supply Corporation is dim, as cutting competition would be bound to come. The whole idea is as unsound as it possibly can be; and so think the ratepayers. The South Metropolitan Electric Supply Corporation distribute in part of the borough; but it is proposed that their area be excluded from the suggested application for powers. The Council tried once before to get authority to purchase the part of the London Electric Supply Corporation's installation within Camberwell, but failed. The renewed yearning for a municipal electricity supply may have been stirred up from outside. We rather fancy that the moving spirit hails from Spring Gardens, and that, when the scheme is, if ever it is, unfolded to the public gaze, it will be found to contemplate the taking of electricity in bulk from the County Council. The subject was down on the *agenda* of the Borough Council for discussion last Wednesday; and the public part of the chamber was occupied by an antagonistic and demonstrative crowd of ratepayers, who made things a bit lively. Three deputations from Ratepayers' Associations attended, and presented petitions against the scheme signed by ratepayers aggregating some 5000. It is evidence that in Camberwell the ratepayers have accurately detected the errors of municipal trading. The growth of local indebtedness, the piling

up of the rates, the profitless character of the Metropolitan electric lighting undertakings in the hands of local authorities, and the unsound finance to which they have given birth were in turn rubbed well into the Council by the spokesmen of the deputations; and there is not the slightest doubt that the ratepayers, having learnt from other boroughs, will not let their own Council go into this mad venture without offering good resistance. The minds of the Council, however, have been so filled with the scheme that they made a technical omission. A bye-law provides that all matters affecting finance should, before being considered by the Council, be referred to the Finance Committee. This had not been done in this case; and therefore the matter had to be set aside, after the deputations were heard, last Wednesday. It is doubtful what will now be done. The councillors had not anticipated this uprising of the ratepayers in opposition to the scheme; and there will be the elections to face shortly. Schism is bound to develop between the timid and the bold sections of the Council. If we are right as to a connection existing between this Camberwell scheme and that of the County Council, it will be interesting to keep an eye on Camberwell. The uncertain position in which last Wednesday's meeting left the matter is not the end.

Considerable interest will shortly hover about electrical affairs in London; for, although there is to be an autumn session of Parliament, the time will be here almost before we are aware of the fact when the formalities associated with the introduction of Bills into Parliament for next session will have to be complied with. Of course, the electrical masterpiece for the session should be the scheme of the London County Council for the supply of electricity in bulk and for power purposes within and outside the Administrative County of London. But there is another matter which will be watched for with peculiar interest, and that has regard to the amount of support the Council will obtain from the City Corporation and the Borough Councils to the proposed introduction of legislation for the regulation of the disturbance of the streets of London by Companies and others who may have legal power to break them open. The Council must have their finger in every pie, with the result that they have got themselves into some inglorious muddles. The report of the Royal Commission on London Traffic is regarded as an excuse for action. It is the matured opinion of the Highways Committee of the Council that great advantage would result if arrangements could be made for all road works by different authorities to be, as far as possible, executed simultaneously at certain times of the year. And a fine old mess London would get into. It would be totally impracticable, with so many distribution networks located in different parts of the roadways, for simultaneous work to be conducted in some thoroughfares, which, studying the convenience of the public and traffic, could not be completely blocked up. Of the elastic term "as far as possible," good use would undoubtedly be made; and it would cover the laying of new services, repairing work, and other urgent operations. It will be interesting to see what support the Borough Councils owning electricity undertakings will be prepared to accord to the County Council, in view of the fact that in the central and busy parts of London it is rarely necessary to open the roadways solely for the purposes of gas supply, inasmuch as the pipes have been for long established there, and that electricity supply and telephone work have in recent years been chiefly responsible for the serious disturbance of the thoroughfares. Under the circumstances, the electricity supplying Borough Councils will hardly care to be governed by regulations manufactured by the County Council. We suggest to the Council that they are exhibiting a little undue haste in this matter, seeing that, if their electrical scheme goes through, they will themselves be wanting to create very grave disorder in the streets of the Metropolis with their cable laying. It also occurs to us that if, or whenever, their street-opening regulating Bill assumes shape, it would be a very good opportunity for the Council to show their unprejudiced feeling for all who use the subsoil of the streets by inserting clauses giving protection to property established therein, and making responsible for injury and resulting damage those who occasion the injury. The Gas and Hydraulic Power Companies and the Metropolitan Water Board would appreciate this action on the part of the Council—more especially if it comes from them voluntarily before their Electricity Bill goes through. It will not hurt the Council, because the Board of Trade say no harm can come to underground property from electricity supply; but how much the graciousness of the act would be valued by pipe owners! Perhaps that will be an inducement to the Council; perhaps it will not.

The truly humble but useful appliance the domestic flat-iron, when heated electrically, we understand from a warning that has been issued against their use, is a dangerous instrument. It seems that in one of the electrical papers there has been an attempt to boom electric flat-irons. Having regard to the fact that at least one large house in England has suffered previously from electric fires caused by such irons, "One Who Knows" has lately written to the "Electrical Review" suggesting that they should not be largely introduced into this country unless fitted with a time-switch or other automatic device, by which all over-heating may be prevented in case an iron is left to itself for a time with the current full on. The best prevention is not to use domestic implements that require so much precaution to render them safe. There is no question about the seriousness of the danger, as the "Review," in a note to the communication of "One Who Knows," admits the fact that "disastrous fires have been caused by the misuse" of these irons, although they are "harmless when in discreet hands." The admission as to "disastrous" fires will not improve the popularity of the electrical flat-iron. It is one of the recommendations of gas flat-irons that they have never been known to cause fires of any kind even in indiscreet hands; and as they are cheaper to use than the electrical type, the householder has no need whatever to introduce into his domestic service something that, through a little negligence—to which most people are liable at times—may generate a "disastrous" fire.

The metallic filament electric lamps are very particular as to how they are treated. Any departure from the exact conditions preferred, and something goes wrong. Not long since, after thousands of tantalum lamps had been sold, the makers considerately informed the world that they were of no use on alternating current systems. Now we are notified that Nernst lamps for circuits below 200 volts are not recommended. What a lot the user of electricity has to remember, to be sure!

THE CASE OF THE METRE.

THE metre has not thrust itself—or been thrust—upon us yet; and there are many people who have made up their minds that such a state of affairs shall not come about if they are at all able to prevent it. Union being strength, those who are of this way of thinking have banded themselves together, under the title of the British Weights and Measures Association. This organization has already been referred to in the pages of the "JOURNAL;" but it may again be pointed out that its avowed object is to oppose the introduction of the metre or any of its derivatives into the British Empire, and to so adjust and simplify existing British imperial weights and measures as to obtain all the advantages of the metric system and some others that are certainly not given by it.

The Association have just issued their second annual report, which it is stated is "one continued story of success throughout the year." There are now co-workers in all the self-governing Colonies and in India; and not only so, but the manufacturers of the United States have vigorously taken up the work, while practical engineers and manufacturers in other parts of the world are getting together to support the efforts of the Association—"for they recognize that British units of measurement are greatly superior for manufacturing purposes to those derived from the metre, and have a much stronger claim for international acceptance." The position of affairs is thus set out: A fourth attempt to pass a compulsory Metric Bill through the United States Congress has dismally failed; while the new British Government have likewise turned a deaf ear to the pleadings of those in favour of the metre. The policy of the Colonies and India is to make no change but such as is made by the Mother Country. In Canada, a lecturer has indeed been sent forth to win over supporters for the metric system; but the manufacturers there have protested against this as being unconstitutional—they having, through the taxes, to pay the lecturer, who is preaching a policy detrimental to their interests. Perhaps as a result of these complaints, it is reported that the lecturer has now been withdrawn. In New Zealand the matter has been left in the hands of the Governor; in Australia the agitation for the metre has been practically dropped; while in South Africa a Commission has reported against the adoption of the metric system until such time as it is made compulsory in the United Kingdom. In order to show the want of justification for the contention that the United States want the metric system, a good deal of evidence has been collected, and is published in the report, as to American opposition to the proposal; and there are also some striking facts about the state of opinion in this country, now that the question is becoming better understood.

It is, however, pointed out that, while the Association are not slacking their efforts to oppose the metre, they are not unmindful of their further object, which is to standardize and simplify British weights and measures. To this end, the Executive have resolved to investigate and collect data to be eventually considered by a convention of English-speaking people. Such a convention, it is urged, should have not only the Colonies and India represented on it, but also the Crown Colonies and the United States. Much information has already been gathered; and the assistance in this direction of anyone in any part of the world will be welcomed. In this connection, it may be mentioned that the address of the Association is No. 25, Victoria Street, London, S.W.

As to the financial aspect of the question, Mr. M'Farland, the Vice-President of the Westinghouse Electric and Manufacturing Company, Pittsburg, says that the cost to his firm of changing over to the metric system would be in the neighbourhood of a million dollars; while there would also be the increased expense of maintaining a portion of the works on the old system, so as to supply repair parts. Mr. Brand, too, who is Chief Engineer of the Buenos Ayres Electric Tramway Company, points out that, in order to complete the metric system, it is necessary to divide the day into tenths, and that this is quite impossible, as it would mean reducing all astronomical data to the new system, the cost of which work would be prohibitive and the inconvenience enormous. Altogether the report contains a good deal of information which is calculated to be of assistance in the better understanding of what is undoubtedly a complex subject.

THE TECHNICAL LITERATURE ON VERTICAL RETORTS.

In connection with the paper published last week, giving "A Comparison of Horizontal, Inclined, and Vertical Retorts," and in view of the one or two references it contains to previous descriptions and results recorded in the Technical Press, we have thought that it might be useful, at this stage in the history of the question, to give a classified list of the literature relating to it. We have, therefore, selected articles which have appeared on the subject in the columns of the "Journal" since its latest introduction just about three years ago; and the full references to them will, we hope, facilitate the work of any student or investigator.

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TWO BIG WATER QUESTIONS.

During the past week, two very extensive schemes in relation to water supply have, after proceeding some way towards a successful issue, at the last fallen through, owing (as is reported elsewhere in this issue) to the Municipalities concerned feeling unable to adopt the recommendations put before them by the Committees who had carried on the negotiations.

First of these may be mentioned Portsmouth, where as long ago as last April the Town Council agreed to acquire the undertaking of the Water Company on terms the principal of which was that the Corporation should hand to each shareholder sufficient 4 per cent. stock to secure to him the full statutory dividend upon his shares. To do this would have involved the issue of stock to the amount of nearly £900,000; and in addition there was the debenture debt of over £167,000, which the Corporation were to pay off. The shareholders were called together, and they also agreed to the terms, which were considered to be fair to both parties. According to the Committee's own showing, the deduction of the outgoings from the receipts, upon these terms, would have left them with a very small annual credit balance; and when referring to the matter at the time, we ventured to ask why the Corporation, for the sake of making so small a profit, thought it was advisable to disturb the existing conditions. It seems that in the interval that has elapsed between then and now the members of the Town Council must have been asking themselves very much the same question; for at a meeting last Tuesday a motion that the corporate seal should be fixed to the agreement, and the necessary steps be taken to promote a Bill to carry out the purchase, was defeated by a majority of more than four to one. In view of all that had gone before, it is not surprising that Mr. Pink, to whose lot it fell to propose the adoption of the Committee's recommendations to this effect, should have exclaimed with a little warmth that he wished some of the members had had the courage to speak as they had then done some months ago, when the matter was first brought forward. It is unquestionably a fact that, as he said, if they had done so, it would have saved an enormous amount of time and trouble. But inasmuch as what the Corporation have decided to do is, after all, to "leave well alone," they may fairly be pardoned for the attitude they have taken up—even though it has been adopted at a somewhat late stage. Clearly, the desire to acquire the undertaking was largely a matter of sentiment; while the pecuniary responsibilities that would have accompanied the transaction would have been of a very material character. Towards the end of his reply to the discussion, Mr. Pink said "it was less than a year ago that the Council were unanimous in their condemnation of the Company; yet to-day they had heard that the Council had every confidence in them." Well, in this respect also surely the members may be allowed to change their minds. Perhaps they have devoted the interval to a more careful study of the Company's affairs than they made before. No doubt, the question of future capital outlay on extended sources of supply had something to do with the refusal of the Corporation to purchase the undertaking on the terms agreed to between the Water Committee and the Company. But in any case the decision is a recognition of the Company's work; for it shows that the Council

are content to rely upon them to furnish the town with an adequate supply of good water. The consumers will lose nothing by the undertaking remaining in the same hands as of old.

The second question is one that has been discussed between Liverpool and Birkenhead. For some years past, a Sub-Committee have been inquiring into the best method of obtaining a future permanent water supply for Birkenhead; and last June they presented a report embodying a scheme prepared by Mr. G. F. Deacon, which it was stated would furnish a supply of 7 million gallons a day, and could later on be extended so as to yield a further 7 million gallons. The cost of the first section he put at £740,000, and of the second at £545,000—a total of £1,285,000. There was also provision for a third section (if it should ever be wanted), which would bring the total daily supply up to 18,660,000 gallons, and the cost of the whole of the works to £1,749,000. It was stated that the scheme was a gravitation one, and that the source of the water was North Wales. The exact spot, however, was not then revealed—owing, doubtless, to a fear that the Council might be forestalled. Later on a visit of inspection was paid to the site, when it was discovered that the idea was to take the water from the River Alwen. But before the scheme was finally adopted, an alternative suggested itself, and negotiations were opened up between the Corporations of Birkenhead and Liverpool, having for their object the permanent inclusion of the former place in the Liverpool water area. Terms were agreed upon between the two Committees (under which Birkenhead was to be supplied on the same terms as Bootle, which only differ slightly from those in Liverpool itself); and these were agreed to by the Birkenhead Town Council. When, however, the agreement came before the Liverpool City Council last week, it was defeated by an overwhelming majority. It was felt that while there could be no objection to Liverpool offering a temporary supply of Vyrnwy water to Birkenhead, it would be a rash thing to bind themselves down to a permanent agreement. But a permanent supply is just what Birkenhead wants; and so it has been decided to proceed with the Alwen scheme. Alderman Burgess, who, of course, has a most intimate knowledge of Liverpool water affairs, stoutly maintained that there would be no risk whatever in taking Birkenhead into partnership, and the Council had also before them a report by the Water Engineer (Mr. J. Parry) to guide them. But nevertheless it is quite possible to understand the reluctance of the members to add to the obligations under which Liverpool at present rests with regard to supplying water to other places, if called upon.

OIL-GAS TAR AND TAR MACADAM FOR ROADS.

Following the lead of "The Times" and the "Telegraph," the "Standard" has started an "Engineering Section," which is intended to give a popular review of engineering progress without attempting to usurp the functions of the Technical Press. For this consideration, our colleagues of the Technical Press will, with ourselves, without doubt be exceedingly obliged. One of the first articles is by Mr. W. H. Maxwell, Assoc.M.Inst.C.E., of Tunbridge Wells; and he takes for his theme a matter of great current interest—the maintenance and construction of roads. As we have before shown in the "Journal," this gentleman is favourable to the use of oil-gas tar; and two paragraphs in the present article confirm his previous advocacy. They are as follows.

Of the numerous materials used in the way of palliatives for application to the dusty areas, nothing appears to surpass the painting of the surfaces with hot tar applied in two or three successive coats, until a close asphalt-like surface is obtained. Two and three coat-work is commonly done at a cost of about 1d. to 1½d. per superficial yard of road surface—a figure which is not beyond the means of most localities, and affords a greater preservation to the road than do the various patent liquids now on the market. The tar is applied hot with brushes, either by hand labour or more recently by the Laisailly tarring-machine. The liquid used is ordinary coal-gas tar; but during the early part of May, 1905, a new departure was made in the borough of Tunbridge Wells by the employment of oil-gas tar—a waste product of the manufacture of carburetted water gas. The advantages of this liquid were found to consist in its greater durability and non-licking up under traffic in wet weather, its greater penetration of the road surface, its cheaper cost and convenience of rapid application to the surface without stoppage of the traffic, and the avoidance of the necessity of sprinkling the finished surface with a layer of sand or grit. Before the application of such a treatment, the road should be put into satisfactory order, and bear a coating of good road metalling.

But for important thoroughfares in urban districts, where the circumstances justify the necessary initial outlay, the best, most permanent, and, in the long run, most economical practice we hold to be the entire change of the class of material used in the formation of the road surface. For this purpose, there appears at the present time to be no better material than a good class of selected slag tar macadam, good examples of which are to be seen under considerable traffic on the Thames Embankment, and in several important thoroughfares in Eastbourne and other places. Such a surface costs 3s. 6d. to 4s. per square yard laid, exclusive of excavation of the old road surface—a first cost not greatly in excess of recoating with an equal thickness of granite.

OBITUARY.

Last Saturday week the death occurred, at Bridlington, of Mr. C. S. Kirby, the Works Manager of the Bridlington Water-Works for about 36 years. He had been ill for several months.

The death is announced of Mr. John Hall, the Secretary for over thirty years of the Sheepbridge Coal and Iron Company, Limited. For a lengthy period he was Chairman of the Newbold Local Board; and when the Chesterfield Gas Company's undertaking was acquired by the Chesterfield and District Water and Gas Board, he became the first Chairman of that body.

The death took place last Tuesday, at Edge Hill, Duffield, of Mr. Henry Swingler, J.P., D.L., who was a member of the firm of Messrs. Eastwood, Swingler, and Co., Engineers, of Derby. Deceased was a Director of the Derby Gas Company for twenty-one years, during fourteen of which he was Chairman—a position which he was compelled to resign early last year, on account of ill-health. It was with deep regret that the Board accepted the resignation; and they placed on record their high appreciation of his valuable services to the Company. Mr. Swingler was a Past-President of the Derby Society of Engineers; and for some years he was a Governor of Derby School. In 1880, he was placed upon the Commission of the Peace for the borough of Derby, and in 1885 was enrolled a County Magistrate. Subsequently he was appointed a Deputy-Lieutenant of the county. The funeral, which took place at Darley Abbey, was largely attended; among those present being the Chairman (Colonel G. Gascoyne), the Engineer (Mr. J. Ferguson Bell), and the Secretary (Mr. Henry Bullivant), of the Derby Gas Company. Floral tributes were sent by the Chairman and Directors of the Company, the Engineer's and Secretary's Department, and the gas office staff.

PERSONAL.

It is a pleasure to be able to record that Mr. Maurice Graham, whose serious illness from, and operation for, appendicitis we referred to in a recent issue, is now once more able to attend to business. There is confidence in saying that his many engineering and personal friends will be glad to learn of the complete re-establishment of his usual health and vigour. This happy issue from a long and a very troublesome affliction serves as an opportunity for pointing out that Mr. Graham is hoping now to renew his connection with the profession of gas-works engineering. It may not be generally known that he was trained at the works of Messrs. Dempster and Sons, of Elland. From 1884 to 1889 he was engaged in the making and erection of all kinds of general gas-works plant, from retort-settings throughout; and his experience since, in modern retort-house building, has been of a magnitude that falls to the lot of few men. It is Mr. Graham's intention now to endeavour to identify himself closer than ever with gas engineering, by carrying on the business of engineer and contractor for all kinds of gas plant. In setting out on this new career, he does so with excellent experience at his back, and furthermore with an individuality of a kind that goes far in smoothing down the rough places in an engineer's and contractor's road. A separate business, under the title of "Graham, Morton, and Co.," is going to be run by Mr. Graham, at Leeds, in the making of conveying machinery. An announcement elsewhere shows that he has purchased from the Liquidator of "Graham, Morton, Limited," the whole of the drawings, designs, patent rights, copyrights, patterns, wood models, &c., and a quantity of machine tools, in order to continue the making of their conveyor specialities. We wish Mr. Graham every success.

Mr. Joseph M'Nichol, who is leaving the Sunderland Gas Company to take up the position of Sub-Manager of the Longford Gas-Works of the Warrington Corporation, was last Wednesday presented with a handsome gold watch, inscribed as follows: "To Mr. Joseph M'Nichol, from the officers and men of the Hendon Gas-Works of the Sunderland Gas Company, on his leaving Sunderland, Sept. 19, 1906." The ceremony took place in the meter-house, amid a large gathering. Mr. C. Dru Drury (Works Manager) presided; and there was with him on the platform Mr. A. H. Bagshaw (Assistant-Manager). In handing over the gift, Mr. Drury said he did not favour indiscriminate presentations; but he would have been extremely sorry if he thought they had let Mr. M'Nichol go away without some substantial expression of their feeling towards him. For nearly sixteen years he had been at the works; and his success should inspire the young lads with a spirit of emulation. It had been obtained by painstaking efforts and perseverance, and an anxiety to master details. Mr. M'Nichol had won their esteem while he had been with them; and they wished him health and happiness and a long and prosperous career. Mr. M'Nichol, in expressing his thanks, said the present was valuable; but when he thought of the kindness and generosity that was behind it, the value increased in his eyes a hundredfold. It was very gratifying if he had won their esteem; and there were many among them he would like to mention, because of their kindness to him, but dare not, for he did not know where to end. He must, however, mention Mr. Drury, from whom he had received every possible kindness and encouragement. Mr. J. Hope, on behalf of the workmen, heartily congratulated Mr. M'Nichol upon his appointment.

THE VALUATION OF GAS OILS.

THE instructive paper dealing with the "Composition and Valuation of Oils used for Gas-Making Purposes," which was presented by Messrs. Raymond Ross and J. Petty Leather at the meeting of the Society of Public Analysts on the 14th of June last, was briefly reported in the "JOURNAL" at the time (see Vol. XCIV., p. 785); but as only a portion of the paper was read at the meeting, and some of the tables then presented and reproduced in the "JOURNAL" were subsequently admitted by the authors to be inaccurate, it is proposed to revert to the subject in this article, which is based on the text of the paper as published in the "Analyst" this month. In view of the digest already given in the "JOURNAL," and of the abstract [see "JOURNAL" for June 10, 1902, p. 1561] of a paper covering much the same ground, which the same authors read before the Society of Chemical Industry a few years since, it is not necessary now to reproduce any substantial part of the revised text from the "Analyst."

Gas-making oils usually are distillates boiling between 200° and 400° C., of which the component hydrocarbons vary as to class according to the source of the oil. It seemed possible that the determination of certain chemical and physical properties of the oil might disclose its nature and composition; and, as a preliminary step, investigations were made on hydrocarbons representative of different classes. These as well as the various oils were gasified, in portions of 15 cc. at a time, in a retort measuring 9 inches by $5\frac{3}{4}$ inches by $4\frac{3}{4}$ inches, the temperature of which was accurately determined by means of an electrical pyrometer. The volume of gas produced was measured, and the proportion of hydrocarbons absorbable by fuming sulphuric acid determined in it. A fractional distillation was also made of different gas oils; and the specific gravity and refractive index of the fractions were ascertained. The results of the distillation tests have already been summarized in the "JOURNAL." The average results of the laboratory gasification tests may be conveniently studied in the following form, which shows the relative values found more clearly than the table as given in the "Analyst." The volumes of gas are stated to be measured at normal temperature and pressure; but whether 0° C. and 760 mm. or 60° Fahr. and 30 inches are taken as the normal conditions, does not appear. The valuation figure is the product of the volume of gas obtained and the proportion of absorbable hydrocarbons in the gas. For comparative purposes, Pennsylvanian oil cracked at 1400° Fahr. has throughout this article been taken as the standard, and assigned the value of 100; and the valuation figures given are relative thereto. They have been deduced from the absolute values given by the authors, in order to facilitate comparison.

Nature of Oil.	Temperature at which cracked. Degrees Fahr.	Volumes of Gas obtained per Unit Volume of Oil.	Percentage of "Hydrocarbons" in the Gas.	Relative Valuation Figure.
Pennsylvanian	1260	445·0	35·8	99·96
,,	1400	529·9	30·1	*100·00*
,,	1510	563·0	26·6	93·84
Kansas	1260	438·9	33·6	92·46
,,	1400	482·6	28·4	85·93
Russian	1260	465·7	34·2	99·86
,,	1510	556·0	22·8	79·48
,, (refined)	1260	429·0	31·8	85·53
,,	1510	518·0	28·4	92·23
,,	1700	550·0	21·5	74·14
Texan	1130	325·0	30·1	61·25
,,	1260	388·3	29·8	72·04
,,	1400	461·8	25·3	73·34
,,	1450	547·7	18·6	63·86
,,	1510	508·8	21·1	67·34
Californian	1130	370·8	29·8	69·28
,,	1260	529·9	26·6	88·37
,,	1400	573·9	25·4	91·39
Roumanian	1130	301·3	40·5	77·13
,,	1260	388·8	33·3	80·85
,,	1400	459·7	28 6	82·43
,,	1450	557·3	20·2	70·58
Galician	1260	452·8	35·5	100·78
Grosny	1130	341·8	34·9	74·76
,,	1260	421·9	34·6	90·84
,,	1400	501·6	25·8	80·63
Borneo	1260	301·0	26·8	50·58
,,	1510	472·0	17 0	50·31
,,	1640	495·0	15 0	46·55
Scotch	1130	286·5	40·3	72·40
,,	1260	426·4	34·2	91·66
,,	1450	491·5	26·1	80·19

Borneo oil, which gave the lowest valuation figure, was examined by chemical means; and the presence of decahydronaphthalene and tetrahydronaphthalene was demonstrated in the fraction boiling at about 200° C. The fractions of Roumanian, American, Texan, and Russian oils boiling between 300° and 350° C., and of Borneo oil boiling between 280° and 340° C., were treated according to Engler's method, in order to separate therefrom the paraffins—*i.e.*, they were mixed with a mixture of equal parts of alcohol and ether, and then cooled to − 18° C. The "paraffins" so separated were gasified, and gave the following results:—

Source of "Paraffin."	Volume of Gas Obtained per Unit Volume.	Percentage of Hydrocarbons in the Gas.	Relative Valuation Figure. Pennsylvanian Oil at 1400° F. = 100·00.
Roumanian Oil	465·4	35·4	103·29
American ,,	431·2	40·0	108·14
Texan ,,	430·2	27·2	73·36
Borneo ,,	342·7	26·4	56·72
Russian ,,	425·3	38·9	103·72

Undecylene and undecane were prepared from oil of rue, and gasification tests were made with them as well as with tetrahydronaphthalene and decahydronaphthalene (all being regarded as typical constituent hydrocarbons) with the following results:—

Hydrocarbon.	Boiling Point.	Specific Gravity.	Vol. of Gas.	Relative Valuation Figure.
Undecane	194° C.	0·746	544·4	115·36
Undecylene	193° ,,	0·773	550·4	100·07
Decahydronaphthalene	172° ,,	0·843	434·1	71·30
Tetrahydronaphthalene	205° ,,	0·977	134·5	11·47

Certain of the oils were next used on a practical scale for the production of carburetted water gas in a plant erected by the Economical Gas Apparatus Construction Company. The following is a summary of the results obtained:—

Oil.	Per 1000 Cubic Feet of Gas Made.			Relative Valuation Figure for the Oil.	
	Pounds of Coke Consumed in Generator.	Gallons of Oil Used.	Candles per Gallon.	Works Test.	Laboratory Test.
American	33·90	2·47	8·90	100·0	100·00
Russian	32·50	2·59	8·73	98·1	99·86
Texan	35·07	3·277	6·20	70·3	73·34
Borneo	33·00	3·63	4·69	52·7	50·58

The utility of the laboratory test values as a criterion of the gas-making values of the oils on a working scale in the plant in question may be judged from these figures. Messrs. Ross and Leather believe that their researches justify them in concluding, generally, that: (1) The open-chain hydrocarbons have the best value for gas making. (2) The presence of double bonds in the chain slightly reduces the value. (3) The presence of one or more rings considerably reduces the value. (4) The more fully hydrogenated the ring, the better its value relative to other ring compounds. (5) Benzene rings have practically no value for cracking purposes.

Regarding only the fractions boiling between 280° and 300° C. in relation to density and refractive index, it would appear that: Pennsylvania oil contains a large proportion of paraffins and olefines, together with some paraffinoid substances. Russian oil consists principally of paraffinoid substances. Texan oil probably contains considerable quantities of complex-ring compounds fully hydrogenated, but not paraffinoid. Roumanian oil varies, but must usually contain considerable quantities of unsaturated ring-compounds. Borneo oil contains a larger amount of unsaturated and partially hydrogenated ring-compounds. Kansas oil more nearly resembles Pennsylvanian oil than Texan oil. Californian oil probably contains a fair proportion of paraffins and paraffinoid bodies, together with some incompletely saturated compounds. The one Galician oil examined appeared to have a higher proportion of open-chain compounds than Russian oil, while the Grosny oil probably contained more paraffinoid bodies than the latter. Scotch gas oils are likely to contain a considerable proportion of olefines, together with paraffinoid substances containing benzene rings.

These notes made from the interesting paper of Messrs. Ross and Leather, in conjunction with what has already been published in the "JOURNAL," will indicate its scope and utility. In regard to the latter, it remains to be established that the valuation figures obtained in the works' tests are on all-fours with the working results which would be obtained in the double-superheater type of carburetted water-gas plant, which is that more commonly used in this country; and some comments made by Mr. W. J. A. Butterfield in the course of the brief discussion which followed the reading of the paper, indicate that he at least considered that the relative values of the oils were somewhat different from those found by Messrs. Ross and Leather.

Arrears for Gas, &c.

We have received from Mr. A. Canning Williams, the Secretary and Accountant to the Reading Gas Company, a copy of a little book which he is bringing out under the above title. It consists of a set of forms of application for payment, arrear sheets, &c., with explanations as to their use. In his preface, the author states that the system described has been evolved out of his somewhat lengthy experience of the subject dealt with, and has been found in actual working to be productive of good results. Though the various forms given have been designed to suit the requirements of gas companies, and (with slight alterations) local authorities owning gas-works, they are also suitable, after making the necessary changes, for use in the offices of water and other undertakings which are invested with similar powers in regard to the recovery of arrears.

Mr. A. B. Pilling, the Clerk to the Metropolitan Water Board, is just now engaged in drawing up a comprehensive report on the present and prospective water supply of London.

Messrs. Crossley Bros., Limited, have just issued a small pamphlet—entitled "Crossley's Gas Plants"—giving particulars and illustrations of producer-gas and pressure-gas installations recently erected by them.

THE DESSAU VERTICAL RETORT-SETTINGS.

Discussion on the Paper read by Dr. Bueb before the German Association of Gas and Water Engineers.

As already mentioned in the "JOURNAL" (*ante*, p. 26), the paper read by Dr. J. Bueb, of Dessau, before the last meeting of the German Association of Gas and Water Engineers was followed by a discussion, in which several members took part. From the report published in the "Journal für Gasbeleuchtung," we are able to present an account of the debate.

Dr. BUEB, in reply to a couple of questions first put by Herren Gellendien and Keller respectively, stated that the ease of working vertical retorts rendered this system of construction perfectly applicable to the smallest gas-works; but that undertakings turning out less than 100 or 150 million feet had better wait before installing them, until more experience on the subject had been gained in the larger works. Beds containing six vertical retorts had not yet been tried, but would be later. The plant at Dessau consisted mostly of settings containing ten 13 feet vertical retorts, which produce about 140,000 cubic feet per 24 hours, with one bed of twelve retorts 16·4 feet long, which has a correspondingly larger output of gas.

THE VIEWS OF DR. BUNTE.

Dr. BUNTE opened the discussion by remarking that some of the special features attending the carbonization of coal in the Dessau retorts, and ascribed by Dr. Bueb to their verticality, were attributable rather to their large dimensions; for similar features were to be met with when greater quantities of coal than were usually treated in individual horizontal retorts were heated in one mass—as in large coke-ovens, for example. Other differences in behaviour were shown by the chemical results to be due to the fact that vertical retorts were almost, or quite completely, filled with coal, which was very advantageous during carbonization, improving the yields of gas, coke, and bye-products. The curve representing the carbonization of a certain weight of coal in four hours must manifestly be different from the carbonization-curve of a larger quantity in twelve hours, whether the heat simply spread throughout the coal more slowly in the second case, or whether one lot of coal was disposed vertically and the other horizontally. This was shown with peculiar distinctness in the curves relating to the production of ammonia and cyanogen. The better calorific value of the gas from vertical retorts was said by Dr. Bueb to be due to the lower proportion of benzol dissociated into carbon or graphite; but it would also appear to arise from more perfect conservation of the methane, a larger quantity of which existed in the gas at first. In the vertical retort, there was (so to say) a comparatively cool channel in the centre, through which the gas escaped; whereas in the horizontal retort it struck against the hot walls immediately on liberation. Even in the latter respect, the amount of coal present in the carbonizing vessel exerted a certain measure of influence, for similar phenomena had been noticed in coke-ovens fitted with horizontal decomposing chambers of great capacity. On the other hand, the vertical retort did derive one advantage from its characteristic position—viz., ease in charging and emptying, provided the retorts and their settings proved to last as well as, from Dr. Bueb's paper, seemed probable.

FUEL CONSUMPTION.

Herr REICHARD next put a question about the fuel consumption, which appeared to be equivalent to 16 per cent. of the coal carbonized, or considerably more than is used in good horizontal retort practice. He asked whether the figure could not be reduced by improved settings, or whether it must be regarded as normal for vertical retorts.

Dr. BUEB, postponing his replies to Dr. Bunte's observations, dealt with the fuel question at once. The consumption was 16 per cent. of the coal; but since the settings were detached instead of being attached to contiguous settings on two sides, it was doubtless 1 or 2 per cent. higher than it should be. Fuel consumption, however, ought to be calculated upon the make of gas, and not upon the weight of coal carbonized. If this was done, it would be found that the consumption under the vertical retort was no greater than under the horizontal retort. According to the variety of coal used, the carbonization period in a vertical retort was eight to ten hours (rarely twelve)—much longer than in a horizontal retort. Nevertheless, the consumption of fuel was not appreciably higher, because the heat supplied to a vertical retort was mainly utilized in the production of gas, whereas in a horizontal retort some of it was wasted in decomposing benzene and ammonia. Still, the fuel consumption under vertical retorts producing 12,560 cubic feet of gas per ton would never be less than that under horizontal retorts yielding 11,120 cubic feet. Thermally, a vertical setting should be more economical than any horizontal setting, because the regenerating plant could be so conveniently arranged. For the erection of the regenerators, a vertical height was available equal to the length of the retorts and the height of the discharging floor—altogether about 21 feet. Regeneration was so efficient at Dessau that the waste gases quitted the plant at a temperature not exceeding 300° C., a temperature which was necessary to maintain the chimney draught. After running for a year without being touched, the passages remained absolutely gas-tight; and the furnace gases still contained about 18 per cent. of carbon dioxide.

Herr KÖRTING, replying to an inquiry addressed to him by the Chairman, stated that the fuel consumption under the 16·4 feet retorts was strictly proportional to that of the 13 feet retorts referred to by Dr. Bueb.

COKE-OVENS, GAS PRODUCTION, AND LABOUR.

Herr RIES next spoke, in response to Dr. Bunte's request that he should give the meeting details of the results obtained with the coke-ovens, fitted with large horizontal decomposing chambers, that have been used at Munich for some years. He regretted his inability to hand the meeting precise figures relating to the working of these ovens on a large and regular scale, because, owing to labour and other troubles, a set of smaller ovens built on the same principle, which should have been ready in the spring, had been delayed in their construction. It was, however, possible from the data already collected to confirm what Dr. Bunte had stated about the carbonization of the coal being perfectly uniform. Moreover, it has been ascertained that, by distillation in large chamber ovens, coal yielded a gas somewhat deficient in natural illuminating power, but of unusually high calorific value; and, as was the case with vertical retorts, the make of gas was found to be excellent, while the tar and coke were quite satisfactory. The construction of the ovens had certainly proved rather difficult, owing to the large joints that had to be made tight. Still, it should be remembered that, in building the present ovens, the object had not been so much to construct apparatus perfect in every detail, as to afford means for judging whether this system of carbonization would prove permanently satisfactory. Should it do so, an important advance would have been made—more important perhaps than those accompanying the employment of vertical retorts. For instance, the speaker believed that it would prove feasible to build ovens with chambers of such size that the carbonization took up to 24 hours for completion; and if this aim could be reached, night work in the gas industry would become a thing of the past. Especially in the present condition of labour, the idea of using large carbonization chambers was very attractive. The speaker and his colleague Herr Schilling carried out numerous experiments on the subject ten years ago; being led to take up the matter mainly because the attitude of labour in Munich was not of the pleasantest. The experiments were still being prosecuted, and might be successful or the reverse—at any rate, they would be conclusive; and it was hoped that an opportunity would soon arise for the publication of the results.

DISCHARGING AND FILLING RETORTS IN ONE OPERATION.

Herr KERN (Strassburg), referring to the advantage claimed on behalf of the vertical retort of being completely filled with coal during carbonization, described a system of charging horizontal retorts he had recently seen at Lyons, where 20-feet through retorts are used. A sheet metal cylinder was provided which filled the retorts accurately. It was stood on end in front of the retort, filled completely with coal, in the same way as a vertical retort was charged, tipped into a horizontal position, and then thrust into the empty retort driving the coke before it. A slide at the bottom was then withdrawn, and the coal, therefore, remained behind when the cylinder was pulled out, leaving the retort quite full. At Lyons they were also attempting to introduce a ten-hour carbonization period. From an inspection of the plant at Dessau, he had come to the conclusion that the transportation of the coke was disproportionately laborious, The operation of charging and discharging was simplicity itself; but the coke had to be moved a long horizontal distance, and then raised again to the mouths of the hoppers. The speaker therefore asked Dr. Bueb whether it would not be possible to build the vertical retorts 13 to 26 feet, or even 33 feet above the floor of the house (instead of only 6 feet), so as to have the coke-store directly underneath, allowing it to fall by gravity, as the coal fell into the retorts.

THE EMPTY SPACE, GASIFICATION OF TAR, AND CONTINUOUS CARBONIZATION.

Herr E. KÖRTING (Berlin), who was fresh from the meeting of the Institution of Gas Engineers, began by alluding to the interest being displayed in vertical retort settings in this country, to the papers read by Mr. Glover and himself, to the admirable discussions following them, and to the friendly welcome extended to the speaker in England. A discussion was, in Herr Körting's opinion, a necessary complement to a technical paper. It is not merely polite to the author to discuss his observations; but the subsequent speeches elucidated the whole matter, and brought to light fresh information. A paper without discussion might as well be read at home. Coming to the subjects then under consideration, Herr Körting observed that the disadvantages of having an empty space above the coal had already been observed at Dessau. Although the heat in the upper part of the vertical retort was very low, an empty space there caused an extraordinary reduction in the quality of the gas, and in the ammonia, and led to inevitable tar stoppages. Before contemplating the gasification of the tar, some idea must be obtained of the commercial consequences of doing so. Theoretical considerations showed that not more than 18,000 or 21,500 cubic feet of gas could be made from a ton of tar; so that it should not be converted into gas unless its value was not more than double the net price of the coal—*i.e.*, the price of

the coal after deducting the residuals. In Berlin last year, the net price of coal was about 7 marks per metric ton, and the price of tar 25 marks per ton. The tar therefore could not have been economically gasified unless its value had fallen to 12 or 14 marks; and, had it done so, the tar would probably have been better used as a fuel. The central part in the whole discussion upon vertical retort practice, however, was, in Herr Körting's estimation, to consider whether there was any technical advantage to be gained from a realization of the old dream of continuous carbonization. It was difficult to see how a lump of coal could be carbonized under better conditions as it travelled slowly through a retort than when it remained stationary. In the former case, the coal passed slowly through places of different temperatures; in the second case, different temperatures gradually reached it—presumably the average results should be identical. A more important matter in vertical retort practice was, as Dr. Bueb had quite correctly stated, that the hydrocarbons in the gas were protected from decomposition. The current of gas travelled at a very high speed, and the upper part of the vertical retort was quite cool. The speaker could not agree with the views expressed at the meeting in London, that the adoption of vertical settings would lead to a greater output of ammonia, nor could he accept the analogy drawn between the vertical retort and the Mond gas plant. In a Mond generator, the coal was exposed to the action of air and steam at a low temperature; in a vertical retort, run continuously, the steam only acted upon hot coke, and an increase in the yield of ammonia must accordingly never be anticipated.

Practical Remarks on the Working-Life Question.

Herr Klönne (Dortmund) was much interested in the statement that the Dessau retorts had lasted for 300 days. This was a most excellent result considering how the settings were built. In the construction of horizontal settings, it had always been the engineer's aim to put as low a pressure as possible upon the retort supports, and to avoid local overheating, in order to prevent the materials from failing prematurely. His chief object, indeed, had been to minimize the tensional and torsional stresses. In the first half of the following table were shown the magnitudes of these stresses about a 10-feet horizontal retort charged with coal at the rate of 242 lbs. per foot run, according as it was carried on 4, 5, or 6 intermediate supports; while the second half represented the corresponding stresses about vertical retorts of the heights stated. [The stresses are quoted in kilogrammes per square centimetre, and may be multiplied by 14·225 to give pounds per square inch.]

Ten-Feet Horizontal Retort.				Vertical Retort.			
No. of Intermediate Supports.	Pressure on Supports	Longitudinal Bending Stress.	Transverse Bending Stress.	Height of Retort. Feet.	Pressure on Supports.	Longitudinal Bending Stress.	Transverse Bending (tensional) Stress.
4	0·133	0·050	..	16·4	0·755	1·40	10·40
5	0·120	0·034	0·85	13·1	0·605	1·13	8·20
6	0·133	0·025	..	9·8	0·453	0·846	6·00

It would be seen that the vertical retort had to bear far greater stresses; the longitudinal bending stress (taking the last line of the table) being 33 times greater, and the transverse stress (taking the first line) 12·25 times greater, than those which horizontal retorts had to withstand. Moreover, in a vertical retort, the stresses were greatest at the bottom, where the temperature was the highest; and since, when submitted to powerful heating, there was no proportionality between the expansion and the stresses of the fire-clay, the speaker believed that the lifetime of vertical retorts would be much shorter than it had proved at Dessau, whenever they were looked after less carefully. Again, one must conclude from the foregoing figures that the lifetime of a vertical retort would be a function of its length. Herr Klönne went on to mention that he had been studying a patent for a vertical retort setting taken out by John Brunton, of West Bromwich, in 1828. This setting, the speaker believed, soon failed through overheating, although the retorts were constructed of cast iron; fire-clay retorts being then unknown. Overheating of the retorts, coupled with the internal gas, coke, and coal pressures, would quickly cause them to bulge until they became brittle and quite useless. For this reason, the employment of vertical retorts was completely abandoned at that time, and was not taken up again until the beginning of the experiments at Dessau. Nevertheless, the idea of arranging retorts vertically was a wonderful advance for so early a date in the history of coal gas, and was by far the most striking event of which they had cognizance. A vertical cast-iron gas-retort must behave much like the cast-iron tube heaters used for raising the temperature of the air supply to blast-furnaces. Although such tubes might be fortified by longitudinal and transverse ribs, and although they were heated more uniformly, and to a much lower temperature, by the blast-furnace gases than coal-gas retorts were by direct firing, the speaker had often seen such tubes bulge until they burst. The longitudinal stress in a 13-feet vertical retort constructed in the manner described in Brunton's patent would be 2·88 kilogrammes per square centimetre; and the transverse tensional stress, 8·2 kilogrammes. Allowing for the unavoidable overheating brought about by lack of proper attention, &c., such stresses were too great for hot cast iron to bear. Even supposing that a vertical setting should work well in other respects, if the men should, on one occasion, omit to draw the charge, and the retorts should thus lose their opportunity to cool, overheating, distortion, and destruction must result. Injury must be done in this way more quickly to the vertical retort than to the horizontal, because in the former case the interior stresses and the heat were concentrated at its lower extremity. In the "seventies" many vertical "Appolt" coke-ovens were in use throughout Westphalia. Mechanical charging, &c., was not so perfect in those days as it was now; and for that reason probably the vertical ovens proved superior to the horizontal apparatus. Since the introduction of the horizontal Coppée oven, however, the vertical ovens had disappeared from the country. Even in Belgium, France, and America, only horizontal ovens remained in service. When these horizontal ovens were employed, it was possible to obtain a coke fit for use in a blast-furnace even when such coals were carbonized as did not ordinarily yield a proper metallurgical coke. A coal-compressing plant was erected in front of the ovens, in which the coal was compressed into a cartridge having almost the same diameter as the interior of the oven. The cartridge was then inserted and carbonized; and by this device not only was the virtual capacity of the oven increased, but the coke was given a degree of hardness satisfactory to the blast-furnace proprietor. This method of charging came to much the same thing as that described by Herr Kern; and he (Herr Klönne) believed that, if the same process were applied to horizontal gas-retorts, great advantages would result. The heavier the charge, the better. The gas was improved in illuminating power and calorific value, there was less graphite, a smaller consumption of fuel, fewer stoppages of the ascension-pipes, thinner tar, less hand labour, and higher efficiency. Should vertical retorts prove as satisfactory as they did at Dessau, when they came to be attended to by less careful hands, material improvements would have to be effected in horizontal settings if they were not to be driven out of the field. But the improvements would be made; and once again in the future the trustworthiness, convenience, and cheapness of the horizontal retort would cause it to occupy the premier position. A setting of nine or twelve 20-feet horizontal retorts, with coal-bunker, charging and discharging machine in front, with the generator under one half and the regenerator under the other, could easily be made superior to a vertical setting in every respect.

Shale Distillation and Coal Carbonization.

Dr. Bunte spoke again, beginning his observations with a few references to the suggested Young and Glover vertical retort described by Mr. T. Glover at the English meeting. As remarked by Herr Körting, Scotch shale was an ideal material for treatment in a vertical retort. Shale scarcely altered in shape during distillation; whereas coal fused together and swelled. Hence no analogy could be fairly drawn between the distillation of shale and the carbonization of coal, for the differences were so fundamental that the suggested shale retort could not be adopted in the gas industry. The speaker next went on to confirm what had just been said by Herr Körting about the gasification of tar. The problem had been attacked so many times that it was desirable to warn intending investigators of its utter futility. The temperature at which tar decomposed was so high, and the consumption of fuel in decomposing it was so heavy, that the hydrogen, which was the principal gas to be obtained, could be produced far more cheaply in other ways. Dr. Bunte proceeded to express his agreement with what Herr Körting had said about the comparison between the Mond plant and the vertical gas-retort. The temperatures required in making coal gas were much too elevated for the decomposition of the ammonia to be regularly hindered.

Dr. Bueb's Reply.

Dr. Bueb, in his reply upon the whole discussion, remarked that it was quite correct to state, as Dr. Bunte had done, that carbonization did not proceed in the same fashion in a vertical retort as in a horizontal retort. Nevertheless, in apparatus of approximately the same diameter, 2 cwt. of coal could be carbonized at least as quickly in a vertical retort as in a horizontal setting. Coming to the remarks made by Herr Ries, Dr. Bueb observed how beneficial it would be for the industry if municipal gas-works would institute experiments on as large a scale as those carried out by the former speaker. At present, the private gas undertakings had to do all the research work. Some six years ago, large coke-ovens were erected by Dr. Schniewind in Boston, from which the city was supplied with oven gas. The enterprise was not successful, as it met with competition; but many important lessons were to be learnt from it. When he (Dr. Bueb) had the opportunity of inspecting it, he found that the plant suffered from what, in his own opinion, was a radical defect, inasmuch as the ovens were heated by part of the gas they made. A further step towards the introduction of coke-ovens into the gas industry was taken by Herr Rothenbach, at Olten, who erected ovens heated with the gas coming from coke-fired producers placed alongside the ovens. Even this plant, however, was unable to withstand the competition of the ordinary coal-gas retort; but the reason for this failure was presumably that the coal remained too long in the oven. Working figures in his (Dr. Bueb's) possession indicated that coal must remain for about thirty hours in an oven if the coke was to be of really good quality. Hence the speaker felt that the large coke-oven

could only hold its own against the vertical retort if it exhibited other new advantages. A system of charging horizontal retorts, identical with that seen by Herr Kern, at Lyons, was introduced into the Dessau works some time ago, as a result of the experiments at Boston and Olten. The setting consisted of six horizontal retorts, rectangular in section, which were charged with a compressed block of coal accurately fitting them, by means of a scoop having a plate at its further end to push out the coke. The setting remained in operation for a considerable time, and was inspected by numerous gas engineers. It had, however, been abandoned, as much better results were being obtained by the use of vertical retorts. With regard to Herr Kern's proposal that a vertical retort should be erected at a sufficient height to avoid a second movement of the coke, it should be pointed out that, in opposition to the saving effected in not having so far to raise the coke, the coal would have to be lifted much higher; and the coal weighed 30 per cent. more than the coke corresponding with it. Moreover, the retort-house would have to be built to such a height that the expense would deprive the idea of its feasibility. Herr Klönne's calculations were highly interesting from a theoretical aspect; but they could not be applied to the vertical retorts at Dessau, which had been in operation for more than a year. The retorts had not been treated with great care, as, owing to the experiments performed in them, they had been handled with unusual roughness. Nevertheless they had not suffered deformation, but had kept their shape distinctly better than horizontal or Coze retorts during the whole time they had been under fire. The many visitors to the Dessau works could confirm this statement. The fire-clay of which the vertical retorts were constructed did not become as "soft as rubber" at the working temperature, but maintained its original form. The weight of the coal was chiefly borne by the lower retort-lid, not by the retort itself. Immediately after the retort was charged, a very rapid evolution of gas occurred momentarily at the places where the coal touched the walls. A ring of coke was thus produced, which relieved the retort from any internal pressure that might subsequently arise. Indeed, this was the first prejudice against vertical retorts that had to be overcome. Most people thought that the swelling of the coal under carbonization must burst the retort. The Dessau experiments, however, soon demonstrated that such was not the case, but that the retort was protected by the annulus of coke. This observation at once showed that vertical retorts were suitable for practical work. Herr Körting's most interesting remarks indicated that English gas engineers had set themselves a larger task than the Germans. The former were not content to proceed step by step, basing each advance on scientific investigation. Their English colleagues desired not merely to carbonize their coal in vertical retorts, but simultaneously to elaborate a continuous process. If they succeeded, their plan must of necessity supersede that adopted at Dessau. The path before them, however, was extraordinarily tedious and difficult. From many years' experience, they at Dessau knew how almost every success in one direction was accompanied by failure in another. Nearly always when some device had been introduced which was an improvement in one respect, an undesired and unforeseen defect cropped up, and had to be overcome. Six years' work with the vertical retort had thoroughly convinced them that only by orderly methods of progression could the problems that still awaited solution be solved efficiently.

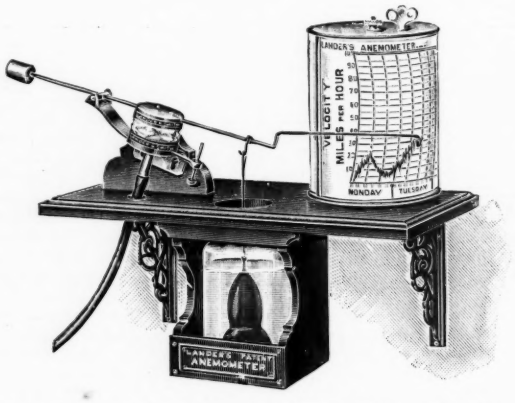
The PRESIDENT (Herr L. Körting, of Hanover) brought the discussion to a close. In a few graceful words, he complimented Dr. Bueb on his valuable paper, and expressed the thanks due from the gas industry to him and to the German Continental Gas Company for the earnestness and success with which they had striven to show how a better gas and a better coke could be produced with less labour than heretofore by means of vertical retorts.

THE LANDER ANEMOMETER AND GAS-PRESSURE RECORDER.

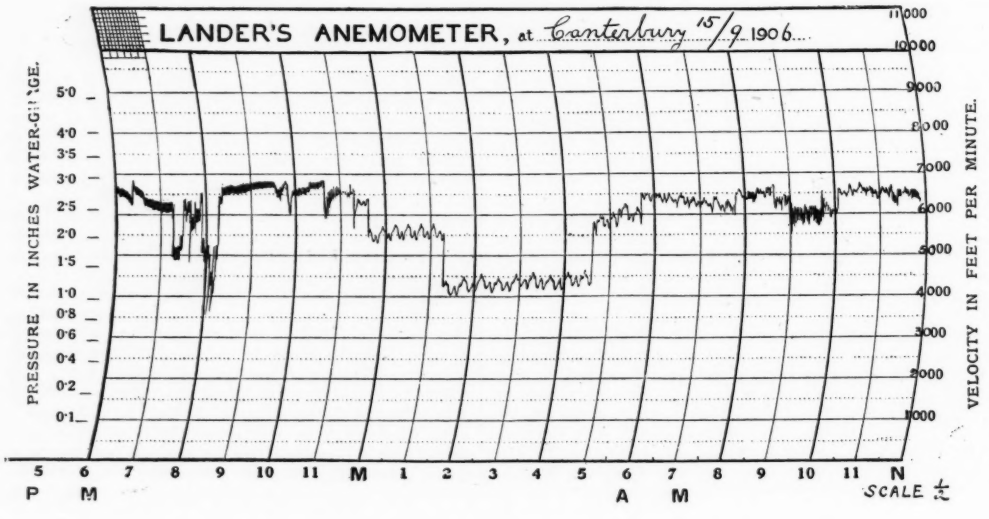
This instrument—primarily designed to indicate and record with great accuracy the velocity of air-currents, chimney and furnace draughts, &c.—has now been made by Mr. Lander of Canterbury, the inventor (in conjunction with Mr. H. C. Page, who is Engineer of the Canterbury Gas and Water Company), applicable to the registration of coal or water gas pressures, at the same time recording the actual velocity, "in feet per minute," at which the gas would pass through the pipes at the pressure indicated.

In the recorder, the pressure is conducted through a small flexible tube to the interior of a thin bellows so delicately counterpoised that movement takes place with the slightest variation in pressure. Attached to the disc or plate of the bellows is a lever carrying a capillary pen, which records on a drum rotated by means of an eight-day clock. The lever is weighted with a small cone floating in a vessel of glycerine, the density of which is so adjusted as to allow the conical float to almost sink. When the float thus lies in the glycerine, it has no weight; but when the bellows are distended by the pressure of the gas, the float rises, and thus the weight gradually increases until the float is completely lifted above the surface of the liquid. The shape and weight of this cone, therefore, determine the exact scale of the recording diagram.

The recorder is perfectly simple in action. It has a minimum of moving parts; and there is absolutely nothing to get out of order. The whole of the mechanism is contained in a small dust-proof case, with glass front, admitting of easy observation. The diagrams are printed to indicate pressure in inches of water gauge, and also velocity in feet per minute. Some idea of its

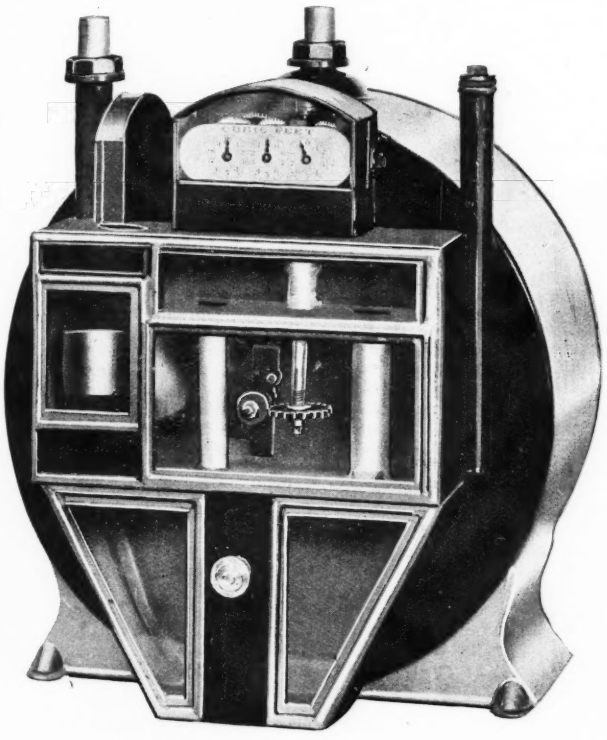


accuracy may be gained by noting that 1 inch on the diagram is equal to ¼ inch of water-gauge, thus enabling small readings to be taken with great precision.



PINCHBECK'S IMPROVEMENTS IN GAS-METERS.

THOUGH the wet gas-meter has been largely superseded by the dry, notwithstanding that the former is accounted the more trustworthy instrument of measurement when working under normal conditions, there are still a large number of gas engineers who have a preference for it, and would fain continue adherence to it if there was the assurance of reliability under casual changes in the conditions of supply. One of the drawbacks to the wet meter has been its susceptibility to increases of gas pressure—increases beyond certain narrow limits tending to force the water seal. Although the maker of dry as well as of wet meters, Mr. John Pinchbeck, of George's Road, Holloway, retains a strong liking for the wet meter, which was the original type of meter with which the name of Pinchbeck became associated, and upon which his inventive faculties have from time to time been turned to free it from objections. The tendency for the water seal to be forced by the augmentation of the pressure of the gas supply, and the water chamber emptied, with the consequent escape of gas on the removal of the drain-plug (by the removal of the plug by the way, it was not a matter of impossibility for consumers to attach their own fittings, and obtain a free supply of gas), has been a matter to which Mr. Pinchbeck, at the instance of the South Metropolitan Gas Company, has been devoting attention with good effect. He has surmounted the difficulty, after considerable experimenting, by means which he has patented, and which have met with the complete approval of experts.



Pinchbeck's High-Pressure Wet Meter.

The meter illustrated is a 5-light one; and authoritative tests show that it will stand any pressure, with the filling tube open and the outlet unchecked, up to 70-10ths. The importance of this will be appreciated by gas engineers. Let us go back for a moment to Mr. Pinchbeck's former invention. In that, the overflow water, escaping down the stand-pipe, first ran into a supplementary water chamber, out of which it flowed by a pipe that extended nearly to the bottom of the main water chamber, and which was then bent upwards—its end being nearly at the top of, and opening into, this chamber. With this arrangement, when the pressure of the gas is high, and especially in the case of small meters, it has been found advisable to provide further means to prevent the water seal from being forced. This is how, by Mr. Pinchbeck's latest invention, it is accomplished: The gas entering the meter is not allowed to impinge directly on to the water. The gas is admitted through a valve preferably contained in a double-cased valve-box, and then passes into a closed chamber. Two pipes connect the closed chamber to the supplementary water chamber. From one of these pipes extends another leading to the measuring-wheel, while the other pipe is perforated at its base to allow the entrance of water; and in it is a further pipe extending above the maximum height of the water. Alternatively, the closed chamber may be dispensed with, in which case the first pipe is connected directly with the double casing of the valve, and the second pipe is provided with a cap at its upper end. The illustration shows the horizontal partition that Mr. Pinchbeck has put in to prevent the gas impinging directly on to the water.

Supplementing the information given above, the gas is conducted from this sealed chamber above the water through the spout to the wheel, and the overflow-tube is adjusted inside the second tube, which is carried up to the water-line; so that the pressure going down the spout also goes down the filling-tube, and checks the water at the overflow within that tube. There it also meets the gas passing through the spout into the overflow-box, where the arrangement terminates in a syphon. The balance of pressure is obtained by bringing the pressure down the spout and the overflow-tube together, so that, when it reaches the syphon, it is lessened somewhat; and, consequently, it is not necessary to have (say) 7 inches of water to stand 7 inches of pressure, because the pressure is balanced.

Besides surmounting this difficulty of the pressure forcing the water seal, the gas-measuring qualities of the meter have been improved. This has come as a sort of reward for the trouble expended in obtaining relief in the one regard.

Perhaps better authentic testimony to the accuracy and uniform working of the improved Pinchbeck meter under varying pressures could not be obtained than the following certificate (dated July 23 last) of Mr. James Stratford, of the City of London Gas-Meter Inspector's Office:—

I have tested a 5-light wet meter (No. 102499) at various pressures from 30 feet per hour at 5-10ths up to 6 inches pressure with outlet unchecked, and find the registration to be as under:—

	Per Cent.
At 5-10ths pressure at 30 feet per hour	4·92 or 0·40 fast.
,, 10-10ths ,, with unchecked outlet . . .	5·04 ,, 0·79 slow.
,, 20-10ths ,, ,, ,, ,, . . .	5·04 ,, 0·79 ,,
,, 30-10ths ,, ,, ,, ,, . . .	5·10 ,, 0·96 ,,
,, 40-10ths ,, ,, ,, ,, . . .	5·14 ,, 2·72 ,,
,, 50-10ths ,, passing gas at 120 feet per hour	5·14 ,, 2·72 ,,
,, 60-10ths ,, with unchecked outlet . . .	5·16 ,, 3·10 ,,

Water drawn off from high to low water-line 21 inches.
Registration at low water-line—
At 5-10ths pressure . . 1·57 per cent. slow.
,, 30-10ths ,, . . 2·72 ,, ,,

The importance of these figures will be recognized by all gas engineers.

The mechanical inventiveness of Mr. Pinchbeck has also been extended to prepayment meters; and his latest invention is an extremely simple contrivance for attachment to ordinary wet and dry meters, to convert them into slots. The illustration shows

Simple Prepayment Mechanism, showing Back Action, Valve Plunger, and Coin Carrier Device.

the back action, valve-plunger, and coin-carrier device constituting the mechanism, the correctness and dependability of which has been placed beyond doubt, to the satisfaction of certain engineers who on first acquaintance regarded such a simple mechanism as incapable of reliable performance. But doubt has now been succeeded by satisfaction, and satisfaction by orders. That is sufficient. In the improvements to which reference is made in this article, there is ingenuity which will surely carry its own commendation.

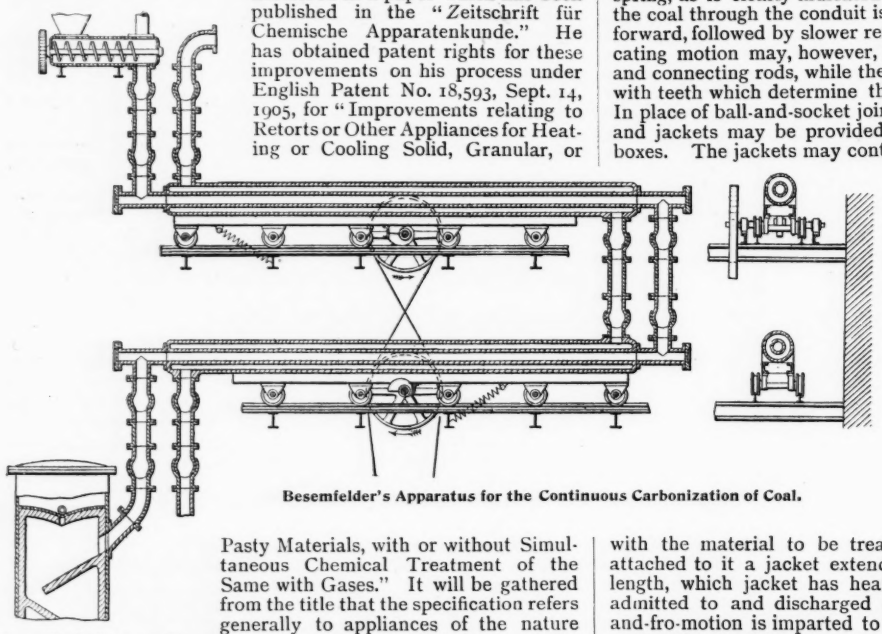
The Radio-Activity of Thorium.

The vexed question of the chemical nature of thorium and as to the origin of its radio-activity forms the subject of a series of papers in the "American Journal of Science." Referring to the matter "Nature" says: "Dr. Bertram Boltwood has determined the amount of *a*-ray activity due to thorium in different minerals containing, in addition to thorium, other radio-active constituents. The values obtained clearly indicate that this activity per gramme of thorium is a constant, independent of the nature of the mineral. The total activity of minerals containing thorium and uranium can, indeed, be calculated from the proportions of these elements in the mineral. The constancy of the 'specific activity' of thorium in different minerals is in support of the view that Hahn's radio-thorium is a degradation product of thorium itself; the transformation of thorium into radio-thorium is probably rayless. It is a remarkable fact, however, that the specific activity of thorium in samples of thorium nitrate and oxide prepared on the commercial scale for the Welsbach mantles, is only about half that of thorium in the same substances prepared directly from the minerals worked with. This is explained by assuming that the commercial method of purifying thorium salts is remarkably efficient in separating radio-thorium; the change of thorium into radio-thorium occurring only very slowly. Similar conclusions were arrived at by Mr. H. M. Dadourian and by Messrs. M'Coy and Ross from experiments of a somewhat different character described in the same number. The question whether thorium can be obtained entirely free from radio-thorium and completely inactive is, however, still unsettled."

BESEMFELDER'S APPLIANCES FOR CONTINUOUS CARBONIZATION.

THE process devised by Dr. E. R. Besemfelder, of Charlottenburg, for the continuous production of a mixed gas, consisting of coal gas and water gas, has been referred to in the "JOURNAL" on several occasions.*

It will be remembered that coal is continuously fed into a carbonizing chamber, where it is heated and carbonized in a current of water gas escaping at high temperature from a generator which receives the coke produced in the carbonizer. The carbonizing chamber or retort has hitherto been described as an inclined cylinder which is rotated on its axis so that the coal undergoing carbonization is continuously moved forward to the lower end of the cylinder which discharges the coke into the water-gas generator. Dr. Besemfelder has, however, since found that under certain conditions it is better to use other means for transporting the coal through the retort; and those which he prefers have been described in a paper which has been published in the "Zeitschrift für Chemische Apparatenkunde." He has obtained patent rights for these improvements on his process under English Patent No. 18,593, Sept. 14, 1905, for "Improvements relating to Retorts or Other Appliances for Heating or Cooling Solid, Granular, or Pasty Materials, with or without Simultaneous Chemical Treatment of the Same with Gases." It will be gathered from the title that the specification refers generally to appliances of the nature described for use in any manufactures in which they may be applicable; but the invention applies in particular to continuous coal carbonizing retorts, and will be discussed only in that connection in this article.



Besemfelder's Apparatus for the Continuous Carbonization of Coal.

Three varieties of the new mode of transporting the coal in the retort are specifically described; but the principle of all may be grasped from a detailed description of one, of which the essential parts are shown in the illustration.

The apparatus is made in two sections, of which one is placed above the other. Both comprise a tubular main conduit, to serve as the retort in which the coal is carbonized, and each conduit is surrounded by an annular jacket, through which heating gases are conveyed for the maintenance of the heat of the conduits and the carbonization of the coal therein. Coal is fed continuously, by the feed-screw shown, into the upper conduit, and passes thence into the lower conduit, and thence (as coke) into the tower in which it reacts with steam and forms water gas. The heating gases travel through the jackets—preferably in the reverse direction to the stream of coal through the conduits—entering by the jointed inlet pipe shown into the lower jacket, passing thence into the upper, and thence to the jointed exit pipe. The connections both of the conduits and of the jackets are formed with two ball-and-socket joints as shown. These joints allow the jacketed conduits to be moved as a whole to and fro; and such a motion is imparted to them by known means, such as the spiral-shaped cam attached to a rotated shaft driving the frame which supports the jacketed-conduit intermittently in the opposite sense to that in which it is pulled by a spring, as is clearly indicated in the illustration. The travel of the coal through the conduit is effected by the intermittent jerks forward, followed by slower returns, of the conduit. The reciprocating motion may, however, be produced by means of cranks and connecting rods, while the bottom of the conduit is provided with teeth which determine the direction of travel of the coal. In place of ball-and-socket joints, the connections of the conduits and jackets may be provided with telescopic joints or stuffing-boxes. The jackets may contain deflecting plates—all arranged helically, so as to cause the heating gases to travel in a circuitous course through the jackets.

The inventor recognizes that it is not new to provide an externally heated stationary retort with a shaking table mounted in the interior of the retort to form a zig-zag surface to assist in propelling material, and also that it has been previously proposed to impart to a retort a longitudinal reciprocating motion. He claims, however, novelty for a heat-interchanging apparatus, comprising a metallic conduit supplied at one end with the material to be treated, such conduit having rigidly attached to it a jacket extending along the greater part of its length, which jacket has heat-interchanging fluid continuously admitted to and discharged from it, while a longitudinal to-and-fro-motion is imparted to the conduit and jacket. Various accessories to this apparatus, which have been referred to in the preceding general account of the invention, are also claimed as novelties.

Dr. Besemfelder believes that his new apparatus presents several advantages, which may be briefly enumerated: (1) Apparatus independent of the propelling means may be inserted for any purpose within the conduit. (2) The material may be subjected simultaneously to mechanical, thermal, and chemical treatment without interfering with its transmission. (3) No interference arises from the heat-interchanging fluid or means. (4) Time is saved, and the material is uniformly and economically exhausted. (5) Reliability, due to the actuating means being outside. (6) Easy insulation. (7) Small height having regard to the length of travel. (8) Wide applicability.

* Vol. LXXVI., p. 156; Vol. LXXIX., pp. 146, 207, 276; Vol. LXXXVI., p. 95; Vol. LXXXIX., p. 35; Vol. XC., p. 363.

MODERN LAMPS.

AFTER inspecting the lamps at the show-rooms of Messrs. Pond and Co., of Farringdon Street, E.C., one might think for a long time before succeeding in finding a situation for which they have not a suitable incandescent lamp. If indoor lighting is being considered, there are, for large and lofty interiors, the "Wis" high-power lamp, the "Pilot," the "Pond," and many other types, all with their special points and good qualities. But if the interior be spacious, and the ceiling low-pitched, and a high-power light is required, there is the "Dwarf Wis" to meet the conditions. It is only 16 inches over all, and has a "consumer," dealing with the products of combustion, for the protection of the ceiling, close to which it may be fixed. For shop window lighting, too, there is the "Shallow" lamp, fitted with inverted burners, which gives a brilliant illumination. There is quite as great a range of choice in outdoor lamps. Where it is desired to combine appearance with high power, the firm have found it difficult to beat their outdoor lamp of the "Wis" series. It was one of their original lamps—if not the original lamp; and its successors have not disputed its claims to be a distinguished looking lamp that can render excellent duty in all weathers. But, at the same time, the "Pilot" arc outdoor light (a shorter lamp, rather less graceful, and wearing a severely business-like aspect) has proved very popular. The "Pond" lamp (mentioned before by name) is also of a design that meets with the eye's approval. It has a cylindrical glass with curved bottom, and is fitted with two burners. Its opportunities are many. Very suitable for mills, wharves, warehouses, and other exposed positions is the "Factory Wis" light. A good selection of lamps for all trade purposes are seen; and the street lanterns supplied by the firm compass all requirements. Among them the "Galeproof" lantern (which has novel and previously described features) takes a prominent position. The lamps mentioned in these notes are variously fitted with inverted and upright burners. For indoor lighting, choice fittings of all kinds are on view; the glass-ware seen is rich in variety and style; and the "Maximum Wis" mantle claims to be the equal of any other asserting to be the best on the market. It is not our business to support or defend the claim; trial and experience will show every user whether or not the title is good.

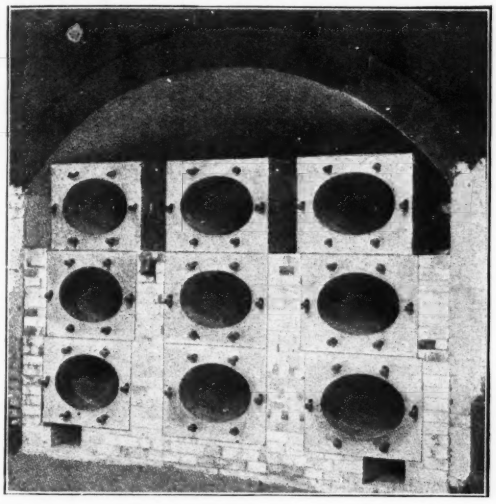
Mr. G. F. Saul has been appointed Chairman and Joint Managing Director of the Lymington Gas and Coke Company, Limited.

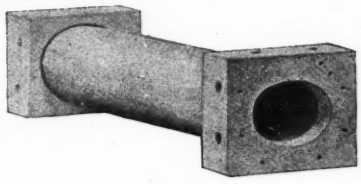
Last Wednesday Mr. T. B. Ball completed twenty-five years' service as Manager of the Rochdale Corporation Gas-Works; and the Gas Committee at their meeting that evening offered him hearty congratulations on the fact.

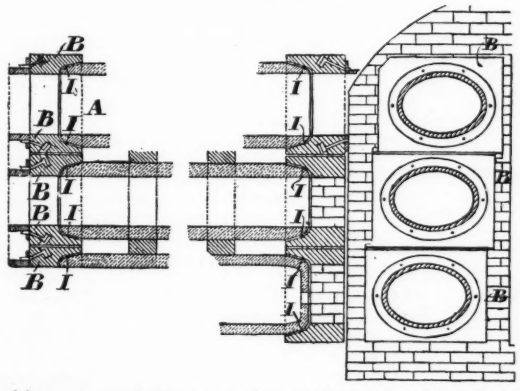
A NEW WAY OF BUILDING GAS-RETORTS.

Writing in the "American Gaslight Journal" early this month, Mr. Frederic Egner called attention to a recent patent taken out in Germany by Herr H. Jerratsch, of Schwerin, and successfully working for over a year.

Mr. Egner says: The old-style retorts, now used for many years, are generally formed in one piece, the head or mouthpiece of which is firmly held in place by the masonry of the front wall of the bench. This description of retorts holds good for nearly all works, excepting such as use either "throughs" or inclines. The arrangement allows for neither expansion nor contraction in the retorts, the consequence of which is, as Herr Jerratsch points out, that during the first heating up of a bench—either a new one or one fired up after having been let down—as soon as the retorts begin to show colour, innumerable small cracks make their appearance. Then, when the heat is pushed to the working stage, after the lids have been closed, some of these cracks are







enlarged by reason of the unequal expansion and weight of the attached mouthpieces and standpipes. At that stage of the heating up, the front wall is usually forced outward slightly, carrying the mouthpieces of the retorts with them, and causing cracks which are only with difficulty kept tight, since they reappear with each scurfing of the retort, as every practical retort-house man knows. The result is that, as a rule, the gas from the first, and often a number of following charges placed into newly-fired retorts, is entirely lost, besides the loss of time, skill, and material required to make good patches for cracks almost impossible to stop, except by the gradually growing skin of graphite or retort carbon—a pretty costly proceeding.

Herr Jerratsch has overcome this condition in the following manner: He makes his retorts in three pieces—viz., an independent mouthpiece, seat or bottom of the retort, and the body or retort shaft itself, as can be seen by referring to the accompanying illustrations. It will be noticed that the outside shape of the mouthpiece and "seat" or bottom of the retort is moulded in a rectangular form, making it quite an easy operation to place in the surrounding wall, saving quite a little time in closing up the front of a new retort-bench, as those familiar with the operation can see at a glance. These rectangular end-pieces of the retort are upon the inside made with an enlarged hollow space corresponding to the bell or hub end of an ordinary gas-main, into which the ends of the body of the retort are pushed, similarly as the spigot end of a gas-main is pushed into the hub end of the one next adjoining it. This can be seen in the line illustration, where A represents the front, and B the back end of the retorts. But that is not all. The long, taper ends of the retort shaft are made with a shallow recess, I, in them extending all around that portion of the end; and into this recess is laid a piece of asbestos rope, which, when the three pieces of the retort are pushed together, forms a soft, pliable, and reasonably tight joint, which, before charging for the first time, is fortified by filling in with fine clay—allowing for expansion in a vertical and horizontal direction.

Herr Jerratsch says that by building the retorts in the manner described, he found no cracks whatever in the retorts after the first heating, and that the very first charge placed into them produced and yielded the full amount of gas from the charge. Those who are familiar with the first heating and charging of fire-clay gas-retorts will probably feel somewhat doubtful of the entire correctness of such a statement; but if there were no cracks whatever, the thing will not appear so very incredible after all. Herr Jerratsch states further that, after nine months of constant and hard use of his retorts—during which time these had, of course, to be scurfed a number of times—only a few, and these almost imperceptible, cracks were to be seen in any one of the retorts set as described.

In small works, many of which (very unwisely) operate without an exhauster, and where the pressure inside the retort is often equal to the full holder pressure, even the smallest cracks will allow the escape of considerable quantities of gas; and even at larger works, where exhausters are employed under the supervision of competent men, this loss is something still to be considered and reckoned with.

On the whole, Mr. Egner considers that Herr Jerratsch's invention is well worth considering by those who either must or still are so unwise as to continue the use of horizontal retorts. These last words call for some explanation. At this time, when gas companies are so closely pressed as never before to reduce prices, when material actually as a rule costs more, and labour is higher and more unreliable and peevish than ever in the history of gas manufacture, it does surely seem worse than senseless to let prejudice, jealousy, or any other unworthy motive (wilful ignorance mostly) hold back owners of gas-works, or their managing officers, from candid, unbiased investigation of such well-tried, well-proved improvements in coal gas manufacture, as have for the past ten years, and still very much more recently, been brought before the reading and otherwise progressive gas public. The hundreds of smaller gas-works, where stoking machinery cannot be economically applied, but where skillful and willing operatives are almost impossible to get, should certainly, it seems, be willing to employ a system of coal gas manufacture which would not only make them independent of any but ordinary labour, but at the same time considerably reduce the actual cost of manufacture. However, to those who will stick to the old great-great-grandfather's system of unimproved, horizontal retorts, despite the loss and vexation which they could so easily avoid, the new retort construction of Herr Jerratsch may well be recommended, for consideration at least.

In order to test the resistance of metals to corrosion by the exhaust gases from gas-engines, sheets of various metals were exposed by Herr J. Pintsch in the exhaust vessel, at 370° C., of a gas-engine supplied with producer gas of low calorific value—800 to 900 kilo.-cals. per cubic metre; and the loss or gain in weight was noted after 5 months in one set of tests, and after 5½ months in another. Bronzes containing tin were attacked most by the gases; copper also was considerably corroded. The metals least acted upon were nickel and brass; the latter being more resistant the higher its content of zinc. Nickel steel was not corroded so much as cast iron, and was better the higher its content of nickel. The outer crust on cast iron exerted a strong protective influence; but even machined cast iron was not strongly attacked.

An analysis is given in the "Journal des Usines à Gaz" of the respective values of the unit of nitrogen in ammonium sulphate, calcium cyanamide, and calcium nitrate, to show the possibilities of the competition likely to arise from the conflict between the sulphate of ammonia derived from gas, the Chile nitrates, and the new compounds of nitrogen obtained by means of electric action. The total annual production of nitrates from Chile, with an average of 16·5 per cent. of nitrogen, may reach 1,567,000 tons, each kilogram of nitrogen in which is valued at 15½d. The estimated amount of ammonium sulphate produced annually by the chemical industries varies from 500,000 to 600,000 tons; and the kilogram of nitrogen in this salt is set down at 14½d.—taking 21·2 per cent. of nitrogen throughout. In calcium cyanamide the value of the nitrogen may range from 13½d. to 15½d. per kilogram; while in calcium nitrate, under certain conditions, the kilogram of nitrogen may be produced at 12½d. Of course, the relative cheapness of the new nitrogen products will depend entirely upon the use of electricity generated by water power at very low rates.

KRAMERS AND AARTS WATER-GAS PLANT AND ITS USE IN GAS-WORKS.

By Dr. A. Steger, of Amsterdam.

[Translation of a Paper contributed to the Société Technique du Gaz en France. Concluded from p. 774.]

It will be remembered that, in the theoretical introduction, I particularly drew your attention to the question of the temperature in the two generators—a temperature that ought to be the lowest possible during the "blow" and the highest possible during the "run." This means that, in practice, it is necessary to aim at an average temperature in the two periods. But as the temperature rises during the "blow," to be lowered again during the "run," the most favourable conditions for the two operations would be when the initial temperature and the final temperature approach as nearly as possible to one another. Therefore the shorter in duration the two periods (or operations) are, the smaller will be the difference of temperature. Actual working has shown that the best results are obtained with 40 to 45 seconds for the "blow," and 5 minutes for the "run." These two periods follow one another with perfect regularity, as you will see from the indicator diagram, fig. 6. This shows the pressure in one of the generators. The upper horizontal lines indicate the "runs." They are separated by small lower horizontal lines which correspond to the very short time of the "blows." But the interest in the indicator consists in this: We see that the periods follow one another instantaneously, without a drop. The pressure, as soon as the steam-cock is opened, goes up to the same figure, and remains there until the air-valves are opened.

There are four sets of apparatus at Amsterdam; and each set has a producing capacity of 15,000 to 18,000 cubic metres per 24 hours (about 530,000 to 635,000 cubic feet). The attendant can easily make either one-half or one-third of this amount, according to whether there are one or two relays of men in the afternoon. The working of the plant is very simple. There is not, so to speak, any apprenticeship needed; and any mistake in the working is, as I have shown, made physically impossible by the safety arrangement of the valve-gearing. The fact that one workman can by himself easily control plant of such capacity, gives gas-works which adopt it great security. Above all, in case of strikes, the interests of the public are no longer dependent (as they are in ordinary works) on the goodwill or caprice of anybody; and this—all political opinion being put on one side—is never to be disregarded. This security is further increased by the fact that the water-gas plant only requires two hours to be started in full work, while a bed of retorts does not begin to evolve gas until some days after lighting-up.

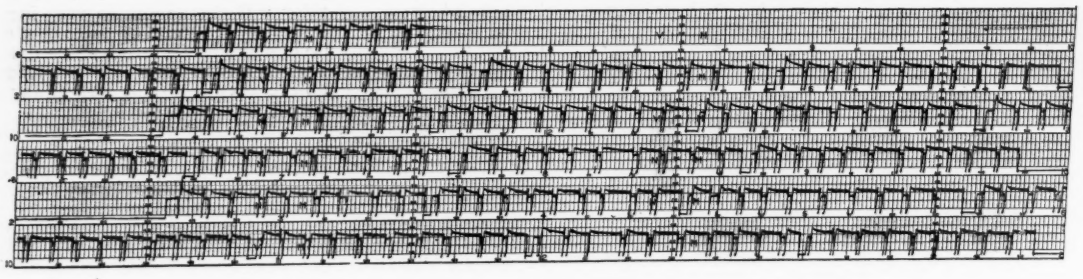


Fig. 6.—Indicator Diagram of the Kramers and Aarts Plant.

To give you an exact idea of the enormous reduction in labour, I have taken some figures from a comparative table published three years ago by Mr. Edward Drory. In the Berlin Gas-Works, different systems of furnaces are used. I will compare Kramers and Aarts water-gas plant with the most modern beds of inclined retorts with coal and coke conveying machinery, and with the old direct-fired retorts with ordinary equipment. The labour required to produce about 175,000 cubic metres (about 6,180,000 cubic feet) of gas per 24 hours is shown in the first and third columns, while that required to make the same quantity of water-gas is given in the middle column:—

Comparative Table of the Manufacture of 175,000 *Cubic Metres of Coal-Gas and of* 175,000 *Cubic Metres of Kramers and Aarts Water-Gas.*

175,000 cubic metres = about 6,180,000 cubic feet.

—	Inclined Retorts with Coal and Coke Conveying Plants.	Kramers and Aarts Water-Gas Plant.	Ordinary Fire-Bar Retort Beds.
Number of beds . .	46	..	118
Number of plants . .	..	9	..
Gas made per square metre of retort (or manufacturing) house	47·1	237	39
Workmen employed per 24 hours in the manufacturing house . .	78 *Detail—* 2 foremen 58 retort stokers 5 firemen 4 pipe-jumpers 3 men for coke plant 3 men for coal elevators 3 men for coal conveying	38 *Detail—* 2 foremen 27 gas attendants 3 firemen 3 men for coke carrying 3 mechanics	267 *Detail—* 4 foremen 236 retort stokers 16 men for coke quenching 11 men for coal carrying

For the production of 175,000 cubic metres (6,180,000 cubic feet), a series of nine sets of water-gas apparatus is necessary, each of which can produce 20,000 cubic metres (about 706,000 cubic feet) per 24 hours. The number of gangs of men being three per day, 27 men will suffice to make the amount named. As—thanks to the short duration of the "blow" in proportion to that of the "run"—three sets of plant can be supplied with the necessary air by only one blower, three blowers will be enough for the nine sets. The steam for the make of gas and for driving the blowers can be supplied by two boilers of 180 square metres (1937 square feet) heating surface. The carrying of the fuel will be done by one man with the assistance of a conveyor. Thus, to make the quantity named—175,000 cubic metres of water-gas—the total number of workmen is 38.

You see that the comparison is all in favour of water-gas, as with fire-bar furnaces, the labour is eight [? seven] times as much, and even with inclined retorts and mechanical conveying, the labour is still more than double ours. That is to say, we have the opposite advantages of the two systems—the simplicity of the fire-bar retort-beds without their army of workmen, and, without the complication of the inclined retorts, half the labour that the latter require. I ought to draw your attention to the fact that in the first column I have not taken into account the labour required for working the boilers and the engines which supply the electricity for driving the conveying machinery. The total figure arrived at is, therefore, still rather too small.

For small installations—as for example (see fig. 7) at Venlo—the boiler for raising the necessary steam for the water-gas plant is advantageously placed on the working platform itself, so that the attendant can look after both the plant and the boiler. The blower is in this case driven by a gas-engine, placed so that it can be perfectly controlled by the workman. Thus the manufacture of water-gas requires only one man. As to the amount made, this depends on the capacity of the apparatus. As I am speaking of the small works of Venlo, I should like, in passing, to call your attention to the method of carburetting that is adopted there. Fig. 8 shows the arrangement of this. The retorts have had holes bored in them at a rather sharp angle, and a pipe carries the water-gas into the retorts. You see that there is every reason to call this method "self-enrichment." I need not delay to show you all the advantages of this simple system. I will only mention one—the principal one—which is, that it costs nothing.

In the plant at Cadiz (see fig. 9) the necessary steam is supplied by one of the boilers of the central electrical station; and the latter also furnishes the motive power for the electro motor-blower. The gas attendant on the working platform thus makes in twelve hours 1800 cubic metres (63,600 cubic feet) of gas, the capacity of the apparatus being 150 cubic metres (5300 cubic feet) per hour. Now six beds of eight retorts can produce 12,000 cubic metres (423,800 cubic feet) per 24 hours—that is 6000 cubic metres (211,900 cubic feet) in 12 hours. The squad being ten men for every six arches, the reduction in labour for small works is easily calculated. In coal-gas works, ten men make 6000 cubic metres; three men are required for 1800 cubic metres. The reduction is, therefore, to one-third.

You see that the advantage arising from the saving in labour with an installation of water-gas is not to be despised. There

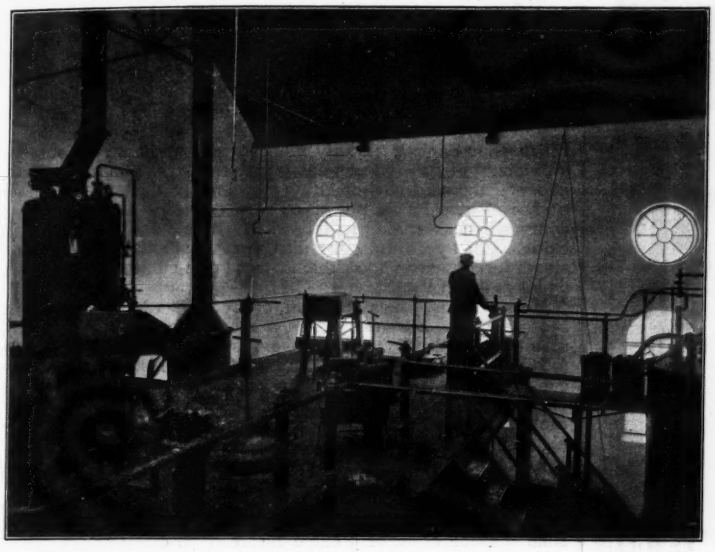


Fig. 7.—The Installation at Venlo.

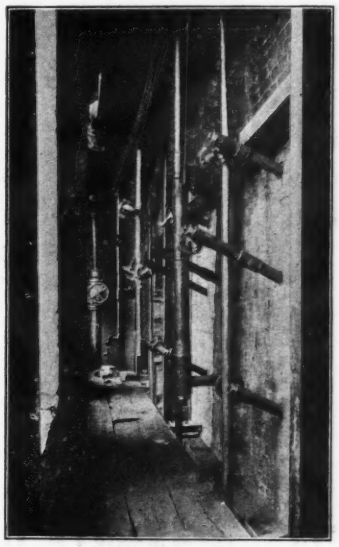


Fig. 8.—The Carburetting Arrangement at Venlo.

is, however, another advantage to which I would specially draw your attention—that is the reduction in the surface required. The plant at Cadiz occupies the same place as a regenerative bed of eight retorts, or some 18 square metres (194 square feet) and 3 metres (9 feet 10 inches) high. The water-gas plant, therefore, supplies per square metre an amount of gas nearly double of that supplied by a bed of eight retorts, and a quadruple amount per metre cube. This proportion increases so much the more as the make is larger; for a daily make of 175,000 cubic metres (6,180,000 cubic feet), it reaches five times as compared with the surface. [See the "Comparative Table," p. 832.]

To realize these proportions in a large gas-works, take the plan of those at Amsterdam with two retort-houses, each having an area of 4000 square metres (43,057 square feet) with a daily make of 100,000 cubic metres (about 3,532,000 cubic feet); while the generator room, which has a producing capacity of 60,000 to 72,000 cubic metres (about 2,119,000 to 2,543,000 cubic feet) only occupies a total area of 945 square metres (10,172 square feet). For the necessary area to carbonize the same quantity of coal reducing it to 2000 square metres (21,529 square feet), the proportional figures are three for coal-gas and one for water-gas. In the same connection, it may be remarked that the site that must be reserved for the coke coming from the coal carbonized can be considerably reduced, as a part of the coke is immediately transformed into gas. As a matter of curiosity, it may be stated that a whole installation could be placed on the site of an old gasholder of 500 cubic metres or 17,660 cubic feet capacity.

I should like to show you a plan on which the two plants are constructed on the most recent lines. At the same time may be pointed out the simple and economical way in which a coal-gas works can be enlarged by installing water-gas plant. For practical reasons, I have chosen the plan of the Zurich Gas-Works, one of the finest and at the same time most economical in working that I know of.* The maximum capacity is from 100,000 to 120,000 cubic metres per day (about 3,532,000 to 4,238,000 cubic feet). Half the works, that is for a daily make of from 50,000 to 60,000 cubic metres (1,766,000 to 2,119,000 cubic feet) was built in 1900. The parts that are of most interest to us are the coal-store, the retort-house, and the coke-shed. The coal-store has a surface of 152 metres by 30 metres, or 4560 square metres (49,085 square feet); and it is intended to keep in stock about 15,000 tons of coal. The retort-house has a length of 150 metres (492 feet), a width of 14·5 metres (47 ft. 7 in.) and a height of 12 metres (about 39 ft. 4 in.). Four benches are placed in it, each of which gives an output of 15,000 to 18,000 cubic metres (about 530,000 to 635,700 cubic feet) of gas per 24 hours. Each bench has eight beds of nine retorts, or 72 retorts, each of which can produce 250 cubic metres (over 8800 cubic feet) of gas per day. The capacity of a single set of water gas plant at Amsterdam is, therefore, equal to that of a whole bench. A photograph of two of these benches—that is, one-half of the total number—which I have reproduced, will afford an exact idea of the great extent of the Zurich installation.* Imagine two of these houses in line, and then look at the generator house of the Amsterdam plant where the same amount of gas is made (see fig. 10). The coke-shed—fig. 11—behind the retort-house is 39 metres (128 feet) by 121 metres (nearly 397 feet), or 700 square metres (7535 square feet). These three buildings are on the left of a straight line which divides the site into two equal parts. The land extending to the right of the line is intended for the anticipated enlarging of the works to double their present capacity. The boiler-house contains three boilers, with 90 square metres (969 square feet) of heating surface apiece. One is used for heating the buildings during the winter; another for supplying the engines with steam; and the third is in reserve. A fourth boiler will be put in immediately. If, instead of doubling the coal-gas works, and so doubling the area, water-gas plant had been erected to produce 60,000 cubic metres (2,119,000 cubic feet) per day, this works would not only not require to buy a single inch of land, but the actually existing area could be diminished, as the water-gas plant would save its own place in the coke-shed by using some of the coke for the manufacture of gas. A little calculation will show this: 60,000 cubic metres of coal gas require the carbonization of 200 tons of coal, which produce 140 tons of coke. If one reckons that the producers require 12·5 per cent., there remain 115 tons of coke. A production of 60,000 cubic metres of water-gas requires 30 tons of coke. Thus about 25 per cent. of the daily make of coke is absorbed by the water-gas. Thus the area of the coke-shed can be reduced by 25 per cent., or one-quarter. Now the

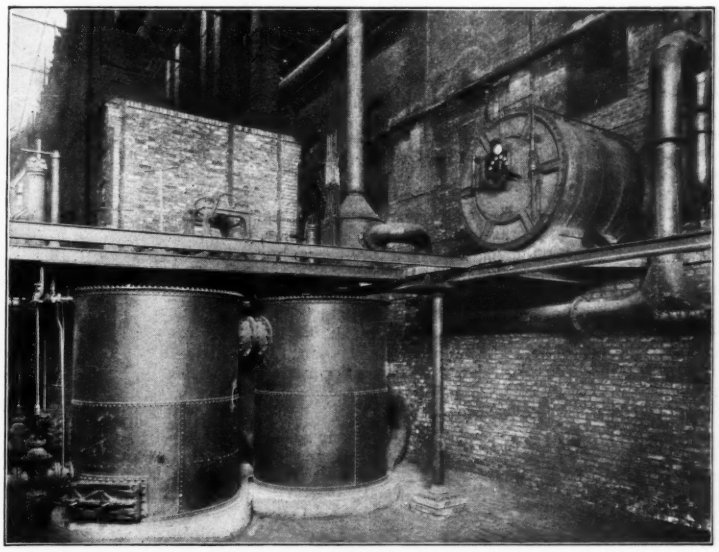


Fig. 9.—The Cadiz Water-Gas Plant.

* For a complete account of these works, see the "JOURNAL" publication entitled, "Zurich New Gas-Works," By Herr A. Weiss, the Engineer of the works.

* In this connection, Dr. Steger reproduced the view of the Zurich inclined retort installation that was given in the "JOURNAL" for Jan. 8, 1901, p. 83, and part of the plan of the works as given the previous week.

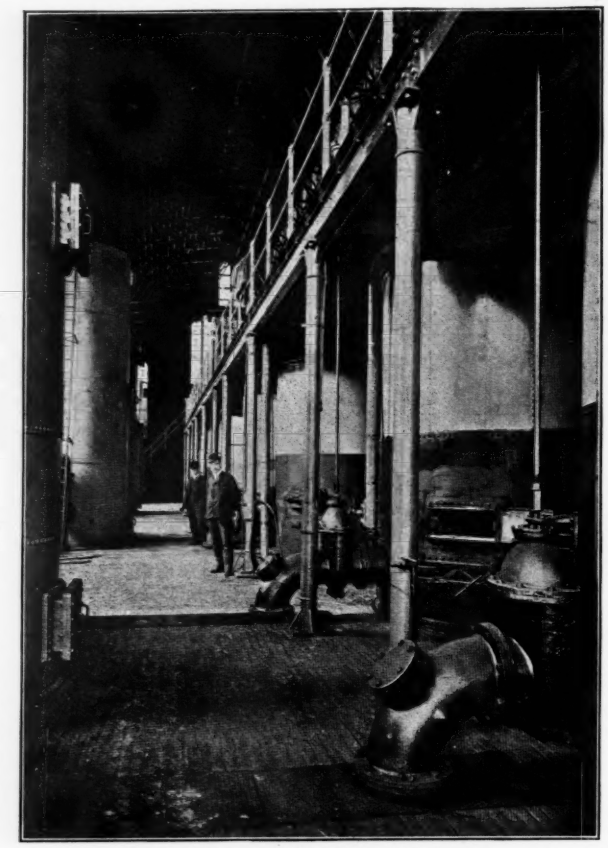


Fig. 10.—The Generator House at Amsterdam.

area required by water-gas plant is only 30 metres (98 ft. 5 in.) by 17 metres (55 ft. 9 in.), which equals 510 square metres (5490 square feet). That is a little more than one-tenth. Thus with coal-gas, you have double the make, double the area; and with water-gas, double the make, and a reduction in the existing area. It is one of those instances where to speak only the truth seems sometimes not to be truthful. The installation would consist of one generator house with four sets of water-gas plant, each able to make 20,000 cubic metres (706,330 cubic feet) per day, thus having 25 per cent. reserve; one machine-room in which would be two blowers driven by two gas-engines; and one house for the manufacture of the poor gas required for the engines, with two producers—900 kilos. (nearly 18 cwt.) per day for 70 horse-power. The steam required for gas manufacture would come from the fourth boiler, the site for which is still available.

To turn again to the region of facts, I may refer to the Uxbridge Gas-Works, where, to double the annual make, we have put up plant to produce 200,000 cubic metres (7,063,000 cubic feet) of gas. The area required for the whole installation is a little more than one-hundredth of the total area.

Before concluding, I should like to draw your attention to the results obtained up to the present from the Kramers and Aarts water-gas system, which I have described to you. At Amsterdam, where the plant has been continuously at work, and where the average make of gas during the months of last winter was 50,000 cubic metres (1,765,000 cubic feet) per 24 hours, a make of 2·25 cubic metres (79·4623 cubic feet) per kilo. (2·2046 lbs.) of carbon consumed in the generators has been obtained; the gas having a calorific power of 2880 calories. At Cadiz, and at Venlo, where the plants only work during 10 to 15 hours a day, we get in ordinary working 2·4 cubic metres (84·76 cubic feet) of gas per kilogramme of coke, not including the coke required for starting the plant to work. The calorific power of the gas varies between 2700 and 2800 calories. At Zevenbergen, in the test which your Society recently made of the system,* we obtained an amount of gas of 2·485 cubic metres (87·7617 cubic feet) per kilo. of coke used, not counting the clinker; the gas, reduced to 0°, having a calorific power of 2920 calories, and a percentage composition averaging as follows: Carbonic acid, 3·5; carbonic oxide, 42·9; hydrogen, 48·2; nitrogen, 5·3. The consumption of steam for a make of 100 cubic metres (3532 cubic feet) of gas was 65 kilos. (143·3 lbs.).

Messrs. H. E. Jones and Son, of London, who also examined the system at Zevenbergen in a manner as minute as it was scientific, obtained the average result of 2·567 cubic metres (90·6577 cubic feet) of gas per kilo. (2·2046 lbs.) of coke with a gas of 2874 calories. The analyses were made by Mr. Leicester Greville. To afford some idea of the way in which the value of the system at Zevenbergen was tested, I give a plan of the works (fig. 12) and a photograph (fig. 13).

The gas is made either in plant A or B. On leaving one of these two, it passes through the washer-scrubber (filled with wood) and enters the intermediate gasholder D. At the outlet of the holder is a T-pipe one of the arms of which goes to a small gasholder E, of 5 cubic metres (176 cubic feet) capacity, and the other to the meter F. The pressure of D being greater than that of E, the gas can easily pass from the former to the latter. A cock at the inlet to E enables the quantity of water-gas to be regulated, and it enters while the gas made is passing regularly and continuously through the gasholder D to be measured at F. After the gas has been measured, it goes to the retorts to be mixed with the coal gas—either for increasing the make, or for the process of self-enrichment. The gasholder E works, so to speak, like a large test-tube; it allows of a continuous sample of the gas being taken throughout the whole time of manufacture. A sufficient quantity of gas of average quality is thus stored, which can be analyzed at leisure. The water-gas, always after having gone through the meter F, can also be taken to the gasholder G. As before, by means of a branch pipe at the inlet to the gasholder to a carburetting apparatus at H, tests can be made on water-gas carburetted with different quantities of benzol and benzine. The mixed gas from the retorts passes first of all to the exhauster I, which is located with the blowers H and the gas-engines M in the machine-room. It then undergoes the ordinary purification, and is stored in the large holder N. From the three gasholders E, G, and N, the different gases can be taken by special pipes to the laboratory O, where is all the necessary testing apparatus.

Speaking of the carburetting of water-gas, I touch on a point which, I think, merits some little attention. Pure water-gas only having half the heat of the combustion of coal-gas, and having insignificant illuminating power, appears at first sight to be in an inferior position in comparison with gas as ordinarily distributed. But, in reality, this is not the case at all. The mantle almost universally used to-day enables us to dispense with giving lighting power to the gas; and hence this difficulty, inherent in the use of pure water-gas, no longer exists. The same mantle, on the other hand, will give a much more beautiful light as its temperature becomes raised. Now, in consequence of the little air that is required for its combustion, water-gas gives a very high temperature of combustion—higher than coal-gas and rich gases in general, which require a great deal of air to be completely burnt. The mantle has, therefore, entirely reversed the conditions required by gas, because instead of a gas having a quantity of heavy hydrocarbons and methane, what we now want is a gas with much carbonic oxide. Hydrogen is outside the discussion, as its proportion is the same in both the gases in question.

* See "JOURNAL" July 17, 1906, p. 166.

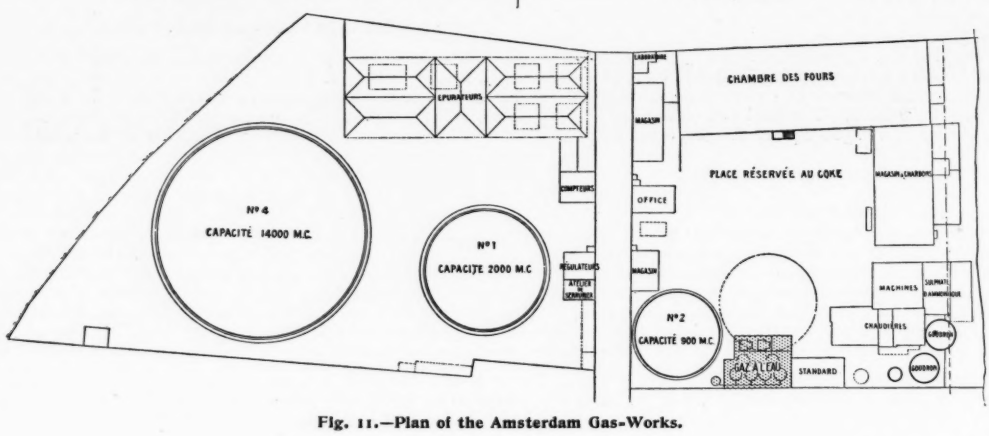


Fig. 11.—Plan of the Amsterdam Gas-Works.

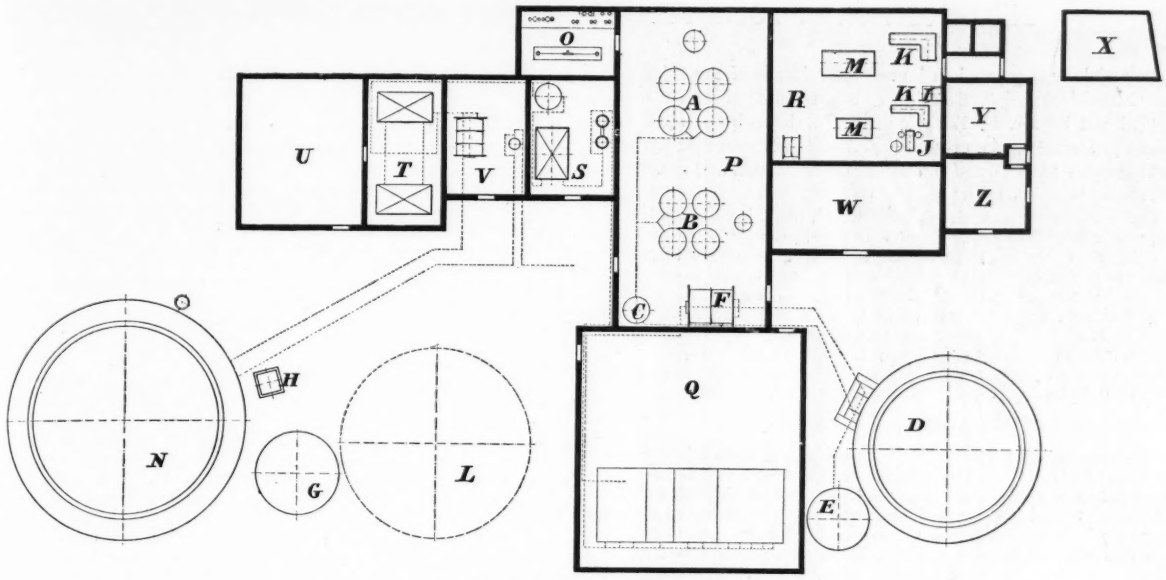


Fig. 12.—Plan of the Zevenbergen Gas-Works.

According to the researches of several scientists, the higher temperature of the flame completely rectifies the less value resulting from the calorific power of water-gas being lower.

There still remains the use of gas for motive purposes and for heating. Not more than coal-gas (nor any less) does water-gas lend itself to use for motive power—especially in engines of some size. Poor gas, made in producers, supplies an excellent power gas to consumers, at the same time that it secures for coal-gas works a valuable means of getting rid of their coke. The only use calling for consideration as regards a reduction in the heating power (because the interests of the consumer may be at stake), is that in gas-stoves and cookers. But, after all, I do not know whether the gas manager would not do better to push the adoption of the coke-stove rather than the gas-stove. In any case, for the amount of gas that is used for heating, let us say at once that, for that also, the comparison is in favour of water-gas; and that, all proportions being taken into consideration, the profits still remain more considerable with water-gas than they can possibly be with coal-gas.

It is not only as regards heating as such, that the temperature of the flame is important, but also in industries such as foundries and glass-works. It is water-gas that is here naturally suitable. If heating and illuminating powers equal to coal-gas have to be given to mixed coal and water-gas, this can be done by carburetting by benzol or benzine. With self-enrichment, the profits will not be reduced; for, as I have said before, it costs nothing. If another method be chosen, the profits will only be reduced a little, even if the mixture of 25 per cent., for example, is kept at 5300 calories (at 0°C and 760 mm.) and at 15 English candles, which are equivalent, as you probably know, to a consumption of 105 litres to the carcel-hour.

Every year the consumption of gas is greater; and works, built for a certain production, often find themselves all at once under the necessity of increasing their output, and with the impossibility of extension. On account of the small space the plant requires, being given also the great saving in labour that it effects, and therefore the reduction in the cost of construction and working, I assert that water-gas is a complete solution of the problem. And for a coal-gas works, the parallel manufacture of water-gas proves the best means of utilizing the principal bye-product of its coal—coke.

Now, in conclusion, a gas-works having first of all to make gas, it seems to me that it is preferable to turn the bye-products into gas rather than to heap them up into ever-enlarging stocks. I hope I have shown you that, as much from the technical point of view as from the economical, water-gas is indeed a godsend for coal-gas works, and that the two kinds of gas, far from being enemies, mutually assist one another.

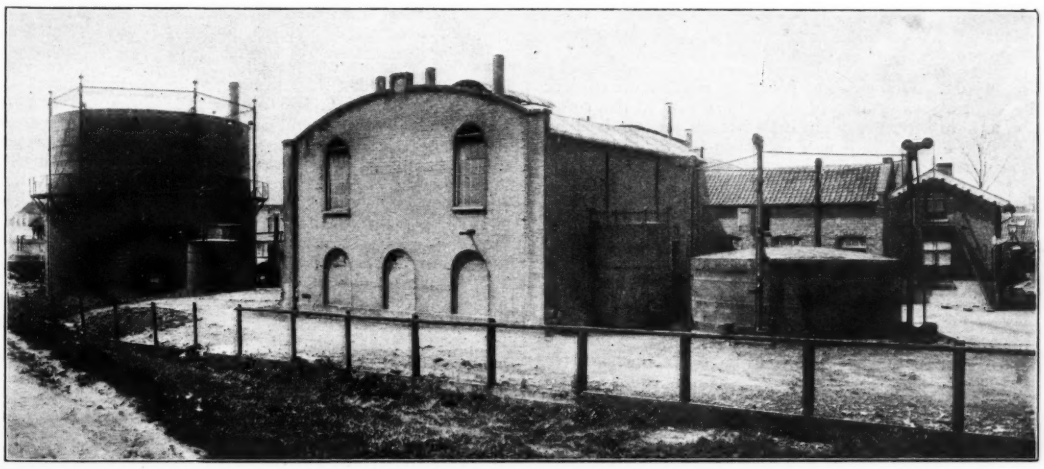


Fig. 13.—A View of the Zevenbergen Gas-Works

A correspondent of the "Financial News," in an article on the portland cement trade of the Thames and the Medway, says that the goodwill of the old firms is being whittled down, not only by foreign competition, but by home competition also, since chemistry and geology have shown that "standard" cement can be made out of materials other than Thames chalk and Medway clay. In consequence, cement works have sprung up in England, Scotland, and Ireland; and as prices go up and trade improves, more will start in the most advantageous spots in the country for obtaining raw material and fuel at a cheap rate, and with shipping facilities at the chief ports of the kingdom. There is a bogey, also, he adds, thanks to the chemist threatening to share the prosperity which the more extended uses of portland cement promise in the modern system of steel and concrete construction; for excellent portland cement can be made from certain classes of blast-furnace slag. When the British ironmaster finds that the slag from his blast-furnaces is a valuable bye-product, from which he can make good cement, he will utilize the waste gases from his coke-ovens for heating kilns and driving machinery to make cement at a price that it will be hard to compete against.

DECOMPOSITION OF SOLID FUELS BY SLOWLY RAISED TEMPERATURES.

An article was printed in some recent issues of the "Journal für Gasbeleuchtung" describing the results of experiments carried out by Dr. E. Börnstein, of Charlottenburg, upon the effects produced on the ordinary solid fuels of commerce by submitting them to destructive distillation at known and gradually increasing temperatures.

The substances examined were wood, peat, brown coal, and common coal. They were heated in a closed apparatus so constructed that they could be raised to a predetermined temperature, approximately equal throughout the mass, and maintained thereat for any desired time; the products of decomposition being collected, measured, and partially or completely analyzed. When the action at the first experimental temperature appeared to be ended, it was raised by 50° C., and the distillation repeated; the whole cycle of operations thus recurring until the maximum limit of the plant (about 450° C.) was reached.

The Apparatus Employed.

The apparatus employed by Dr. Börnstein is shown in the two annexed illustrations. The retort A (more clearly visible in fig. 1) consisted of a horizontally-disposed cylinder of sheet iron with flat ends, riveted and brazed together. It was about 14 inches long by 7 inches in diameter; the metal being 2·5 mm. in gauge. One end was fitted with a strengthening flange, and was made detachable, so as to afford access to the interior. The loose end was made tight against the body of the retort by four clamps and a washer of asbestos millboard. At the upper part, the retort was provided with an outlet for the gases and vapours, and a depending closed pipe for the insertion of a thermometer; a nitrogen thermometer being used when working at temperatures above 300° C. The bulb of the latter was plunged (within the pipe) into brass filings; but its stem was protected by a layer of asbestos. The whole retort was supported in two saddles of hoop iron centrally within a rectangular air bath of sheet iron, 20 in. by 11 in. by 14 in. in size. The lid of the bath was detachable, and carried a chimney 28 inches high and about 2 inches in diameter. The heat was obtained: (1) From three parallel lengths of perforated gas-barrel lying close together under the base of the retort, and supplied with gas through a common injector and air-bulb; (2) from two similarly designed pipes about 4 inches higher, the flames of which played upon either side of the retort. The construction of the air-bath is indicated by fig. 1. Fig. 2 represents the "metal-bath" that was employed in certain experiments.

The entire duplex burner was supported on a graduated telescopic stand, so that the heat could be more perfectly regulated by adjusting the distance between the gas-jets and the walls of the retort. The air-bath system of heating the retort was used during the examination of most ordinary coal samples, but in other cases a metal bath was preferred. The metal bath was composed of two concentric flat-ended cylinders of sheet iron of such sizes that the annulus between the retort and the inner cylinder was about 1 inch in width, and that between the two cylinders about 2 inches. The inner cylinder was constructed in two pieces, separating on a horizontal plane; the outer cylinder had a detachable end and a loose slide on the top for the passage of the projecting attachments of the retort. The retort was carried, as before, in hoop iron slings; the inner annulus being packed with iron filings. The outer annulus was empty, except for four or five longitudinal pipe burners disposed symmetrically round the apparatus; each burner having its own

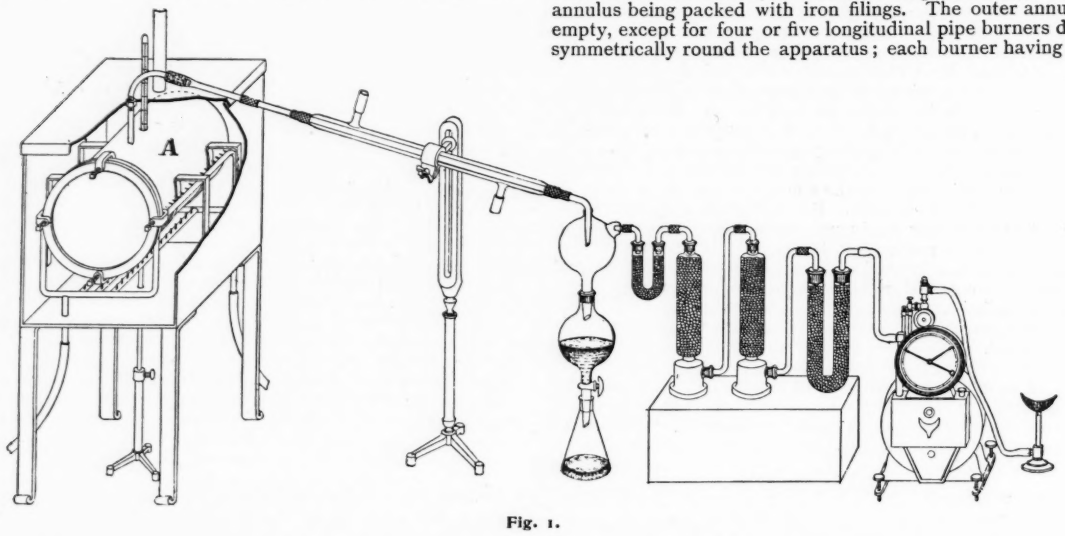


Fig. 1.

gas and air supply. Experiments specially performed showed that the results of distilling the same variety of fuel in the retort at a given temperature were identical whether the air bath or metal bath system of heating it was adopted; the only difference being that the rise in temperature was slower when the heat was transmitted to the retort from the metal bath.

The outlet pipe of the still was connected with a union and asbestos ring to a bent brass tube; and the latter was connected with asbestos packing to the inlet of an 18-inch Liebig condenser. The condenser outlet was fused into the uppermost opening of a three-necked globular receiver. The bottom opening communicated with a stoppered separating funnel and an Erlenmeyer flask underneath, for the reception of the tar, &c. The side neck of the receiver led the gases into a second condenser pointing upwards, as shown in fig. 2; thence, as in fig. 1, through two U-tubes charged with glass wool or broken pumice (the first tube having a stoppered outlet at the base) into two or more towers or U-tubes filled with pumice treated with anhydrous copper sulphate, and a layer of calcium chloride on the top; and finally through an experimental meter, after which the gas was either consumed at a burner or collected for analysis in a 30-litre Hempel holder.

When the material under examination was wood, the sample was split up into sticks as long as the retort and as thick as the finger. The charge was 1 kilogramme. Other substances were crushed into lumps about the size of walnuts; the charges being 2 kilos. in the case of peat, 4 kilos. in that of brown coal, and between 2·5 and 5 kilos. in the case of the coals, according to the degree to which they swelled on heating. After the charge was inserted and the whole apparatus proved to be tight, the retort wss cautiously and slowly heated; so that the temperature rose to a certain point and remained constant for some time, only rising further when the whole charge had been uniformly brought to the temperature in question. Inspections of the fuels so heated showed them to be uniform in appearance throughout, indicating that the maximum degree of heat had been equal all over the retort. If, on examination, the residue left by any fuel appeared to have been irregularly heated, the experiment was rejected. At the beginning of each test, the following temperatures were recorded—viz., when the first drop of aqueous liquid fell into the receiver, when the first drop of oily matter fell, when the copper sulphate was first darkened, and when the gas at the outlet of the meter was first inflammable. The operation was then continued until the thermometer began to rise above the desired point.

The lowest working temperature was 250° C.; no appreciable amount of decomposition taking place below it. In each subsequent test the maximum temperature was increased by 50° C. up to 450° C. The last mentioned temperature was seldom exceeded; partly because the apparatus did not lend itself to the production of higher heats, and partly because the poorer grades of coal only began to yield volatile products just below that temperature. The Altendorf coal, however, was distilled at a somewhat higher temperature, in order to obtain more tar for the investigation of the solid hydrocarbons. At the conclusion of each test, the weights of the "sulphur compounds," of the aqueous, and of the tarry distillates were determined, the meter was read, and the volume of gas evolved was corrected for the amount of air in the retort. Each experiment was repeated several times; the figures in the tables (pp. 838-9), therefore, being averages. The original and the final materials left after treatment at 450° C. were analyzed; representative samples of the whole charge being employed. Analyses of the intermediate residues were performed on small samples of 25 to 50 grammes removed from the retort; due corrections being afterwards made for the diminished quantity of material submitted to distillation at the higher temperatures. The tar obtained at each separate temperature was tested for its specific gravity, and for the amounts of basic and acid matter present; also for the paraffins according to the Holde process.

Owing to the small yields, it was only possible to carry out an ultimate analysis of the tar after bulking the whole amount obtained at each working temperature. The specific gravity and reaction of each sample of aqueous liquor were determined. It was also distilled, and the distillate and residue examined qualitatively. During the course of the work, it was noticed that the copper sulphate tube absorbed something besides "sulphur compounds;" for on distilling the foul pumice with steam, oils were obtained having odours suggesting the presence of organic matter containing sulphur. The quantity of oil so recovered was, however, too small to permit of its nature being ascertained.

Single or bulked samples of the gases obtained from the different fuels were analyzed quantitatively. As it proved that higher homologues of the methane series were present in many of the gases given off by the brown and ordinary coals, the analysis was carried out as follows: The carbon dioxide and monoxide were first absorbed as usual; one part of the residue was mixed with air and oxygen and led over heated palladium-asbestos to estimate the free hydrogen present, a second part being mixed with a known quantity of air and oxygen, exploded, the contraction measured, and the resulting carbon dioxide, the remaining oxygen, and the final residue being determined. Hence values were found for the free hydrogen, the free nitrogen, and for the contraction, as well as the carbon dioxide corresponding with the hydrocarbons. If the ratio between the latter exceeded 2 : 1, higher paraffins must have been present in the original gas. When this was the case, calculations were made on the assumption that ethane was the only saturated hydrocarbon other than methane; and sometimes the figures so obtained added up properly to a total of 100 per cent. Frequently, and generally when the gas was derived from ordinary coal distilled at 450° C., such a method of calculation gave a total exceeding 100 per cent., so that other paraffins beside methane and ethane must have been produced. Since the available data were not sufficient for the purpose of identifying the higher homologues, the paraffins are returned in the tables (pp. 838-9) as methane and ethane only; but, according to Bedson's suggestion, a value for n has been deduced from the explosion process, which represents the average amount of carbon in the total proportion of saturated hydrocarbons—$C_n H_{2n+2}$—found in the gases.

A curious circumstance was brought to light during these investigations. On several occasions when duplicate samples of the same fuel were heated under strictly identical conditions, the two distillations being superintended by two different experimenters, one of the two parallel gas samples contained methane as the only paraffin; whereas the other contained its homologues. This shows what small differences in the method of conducting the heating process may affect the final results. Some of the irregularities noticeable in the quantities of oxygen and nitrogen found in the gases may be explained by the large capacity of the still in comparison with the volume of gas evolved; traces of air being thus left behind. Part of the nitrogen may have come from the fuels themselves; but the low working temperatures render this doubtful.

Experiments with Wood.

The wood employed was deal, taken from the main trunk of the tree, and free from knots. In its air-dried state it contained 48·75 per cent. of carbon, 6·48 per cent. of hydrogen, 0·63 per cent. of nitrogen, 40·75 per cent. of oxygen, 0·08 per cent. of sulphur, 3·21 per cent. of moisture, and 0·10 per cent. of ash. On heating, the first (non-inflammable) gas appeared at 165° C.,

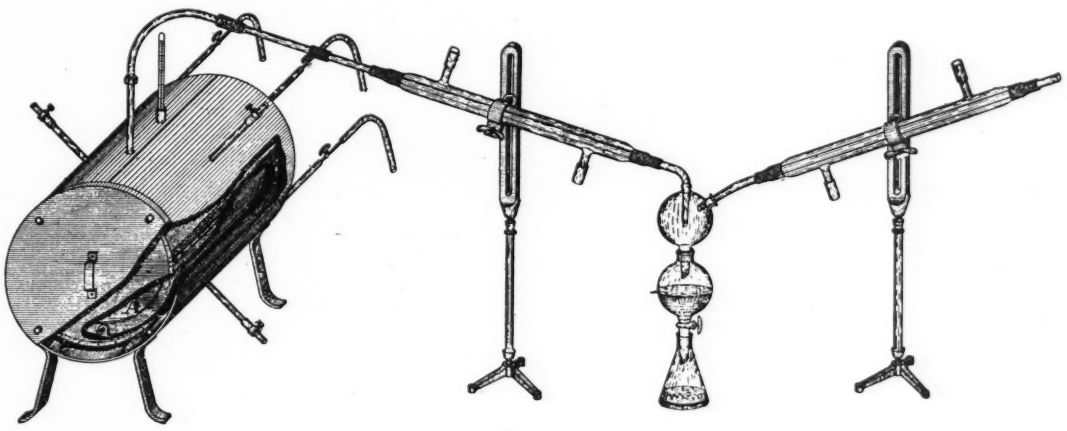


Fig. 2.

water at 180°, inflammable gas at 280°, tar about 300°, and sulphur compounds at about 280° C. The products obtained per kilo. on distillation at different temperatures were as follows:—

	Water. Grammes.	Tar. Grammes.	Gas. Litres.
Up to 250°	65·0	—	6·1
250–300°	65·3	4·9	11·1
300–350°	145·7	32·3	41·0
350–400°	71·2	24·0	29·2
400–450°	20·9	20·6	29·2

The total yield of sulphur compounds was 1·3 grammes. The residue left in the retort after heating to 250° was a little yellower than the original wood, but retained its natural fracture. At 300°, it was pale brown externally, and broke into short splinters; at 350°, it was dark brown and pulverulent; at 400°, brownish-black and easily friable; and at 450°, it was a pure black charcoal. The specific gravity of the final residue, taken at 20° C. in "paraffinum liquidum," was 1·27; that of the original rasped wood was 1·25. Adopting the plan Fischer has already recommended for use with coal to indicate its composition—viz., quoting the number of atoms of each element present per 100 atoms of carbon—the five different wood-residues gave the annexed figures on analysis:—

	Original.	Up to 250°.	Up to 300°.	Up to 350°.	Up to 400°.	Up to 450°.
Atoms of H	159·5	147·9	123·9	103·4	71·4	50·4
Atoms of N	1·1	0·4	0·6	0·4	0·5	0 4
Atoms of O	62·8	59·4	49·8	30·7	17·3	2·9

The figures representing the yields of tar, liquor, and gas, and those recording the composition of the residues, show that per

	Up to 250°.		Up to 300°.		Up to 350°.		Up to 400°.		Up to 450°.	
	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.
C	0·8	49·6	1·3	49·1	9·2	41·3	14·0	36·4	14·2	36·2
H	0·6	6·1	1·6	5·1	3·1	3·6	4·5	2·2	5·2	1·5
N	0·4	0·3	0·3	0·3	0·5	0·2	0 4	0·2	0·5	0·2
O	2·9	39·3	9·6	32·6	25·3	16·8	33·8	8·4	40 8	1·4

100 parts of wood free from moisture and ash, the carbon, hydrogen, nitrogen, and oxygen of the original material were split up between the solid residue and the products of distillation at the different temperatures in the manner shown.

The aqueous distillates were clear liquors, which turned somewhat brown on standing. Their reactions were acid, and they readily reduced ammoniacal silver and Fehling's solutions. The specific gravities of the different fractions ranged between 1·005 and 1·10; the density of the bulked liquor was 1·06. On a second distillation some volatile acids and a small quantity of neutral oils boiling between 80° and 200° or upwards passed over with the steam. The acids were acetic, formic, and one or more of higher molecular weight. The calcium salts of the latter reduced cold ammoniacal silver and hot Fehling's solution. The greatest part of the acids was in the fraction resulting from the distillation of the wood between 300° and 350°; most of the remainder was in that passing over between 350° and 400°.

The tars were clear and brown liquids, darkening in colour as the temperature rose. Their specific gravities were (in ascending sequence) 1·074, 1·115, and 1·104; the density after bulking was 1·106. The bulked tar contained 68·61 per cent. of carbon, 8·13 per cent. of hydrogen, 1·84 per cent. of nitrogen, and 21·42 per cent. of oxygen. On distillation, 24·8 per cent. passed over between 90° and 200°, 31·4 per cent. between 200° and 300°, 14·8 per cent. between 300° and 335°, while 29 per cent. remained behind as a viscid black pitch.

The gases were composed as follows:—

	300-350°.	350-400°.	400-450°.
CO_2	53·5	55·0	28·0
C_nH_m	0·2	1·5	5·0
CO	27·7	32·6	29·0
H	3·7	3·0	17·3
CH_4 (only)	14·9	7 9	20·6

In comparison with the analyses of wood gas already published by Pettenkofer and by Knapp, the present author's results show a low proportion of hydrogen, an excess of carbon dioxide, and a small quantity of carbon monoxide.

TABLE I.

—		1.	2.	3.	4.	5.	6.	7.	8.
Moisture in original coal	per cent.	2·85	0·89	1·05	1·36	0·77	1·32	0·66	0·61
Ash " " "	"	1·91	3·66	0·97	1·98	3·78	12·22	3·47	3·54
First appearance of water	C°	about 200	about 200	about 200	about 200	about 200	about 200	about 200	about 200
Copious " " "	C°	250	350	290	300	290	300	400	..
First oily distillate	C°	250	200	240–290	200–225	about 150	about 200	about 200	230–250
True distillation began	C°	325–360	400	360–385	390–400	434	425	about 400	..
First combustible gas	C°	350–364	355	380–410	410	400–425	about 430	about 415	425–445
Copious production of gas	C°	375	360–400	396–415	420	420–430	410–430	433	430–450
First appearance of sulphur	C°	290	280–345	305	310	260	330–350	250	280
Distillation Products at 450° C.									
Water	grammes per kilo.	69·4	23·4	43·0	47·8	31·8	43·8	16·9	14·7
Tar	"	81·9	60·4	75·3	95·8	49·3	52·3	29·8	9·0
Gas	litres per kilo.	28·6	30·5	23·4	17·6	14·4	13·1	16·7	8·2
Sulphur compounds	grammes per kilo.	1·64	2·5	2·0	3·7	1·4	1·9	0·4	0·1
Total volatile matter at 450° C.	per cent.	17·15	12·11	15·72	18·42	8·55	12·50	7·10	4·05
Total volatile matter by ignition	"	37·57	29·23	32·63	36·51	28·60	30·21	23·0	16·91
Total coke and ash by ignition	"	62·43	70·77	67·37	63·49	71·40	69·79	77·0	83·09
Proportion of total volatile matter expelled at 450° C.		45·65	41·43	48·17	50·45	29·89	41·37	30·87	23·95

TABLE II.

—	1		2		3		4		5		6		7		8	
	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.	Original.	Heated to 450°.
Composition of Coal free from moisture and ash.																
Carbon . . . per cent.	80·99	87·84	86·70	87·97	85·09	87·74	84·90	87·60	86·04	87·45	82·87	86·82	88·02	89·97	89·25	90·21
Hydrogen . . "	4·67	3·69	5·35	4·43	4·82	3·83	4·44	3·95	5·18	4·29	5·06	4·09	5·20	4·57	4·46	4·44
Nitrogen . . "	1·13	0·94	0·81	1·17	1·08	1·07	0·98	1·15	0·88	1·05	0·70	0·33	0·93	1·15	0·95	1·08
Oxygen . . . "	12·26	6·56	5·58	5·06	7·95	6·28	8·13	6·49	6·25	5·74	9·64	7·36	4·79	2·96	3·06	2·74
Sulphur . . "	0·95	0·97	1·56	1·36	1·06	1·07	1·55	0·81	1·65	1·47	1·73	1·40	1·06	1·35	2·28	1·53
Per 100 atoms of carbon—																
Atoms of hydrogen . .	69·1	50·3	74·0	60·4	67·9	52·4	63·8	54·1	72·1	58·8	73·3	56·4	70·8	60·9	59·9	58·9
Atoms of nitrogen . .	1·2	0·9	0·8	1·1	1·0	1·0	1·0	1·1	0·9	1·0	0·7	0·3	0·9	1·1	0·9	1·0
Atoms of oxygen . . .	11·3	5·6	4·5	4·3	7·0	5·4	7·2	5·6	5·4	4·9	8·7	6·4	4·0	2·5	2·6	2·3
Specific gravity . . .	1·32	1·34	1·21	1·35	1·29	1·33	1·30	1·37	1·35	1·38	1·39	1·43	1·34	1·37	..	..

TABLE III.

—	1		2		3		4		5		6		7		8	
	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.
Carbon	7·0	74·0	9·1	77·6	10·8	74·3	13·0	71·9	5·6	80·5	7·7	75·2	5·5	82·5	1·2	88·0
Hydrogen	1·6	3·1	1·4	3·9	1·6	3·2	1·2	3·2	1·2	3·9	1·5	3·5	1·0	4·2	0·1	4·3
Nitrogen	0·3	0·8	..	0·8	0·2	0·9	0·9	0·7	..	0·9	0·4	0·3	..	0·9	..	0·9
Oxygen	6·7	5·5	1·1	4·5	2·6	5·3	2·8	5·3	0·4	5·8	3·3	6·4	2·1	2·7	0·4	2·7
Sulphur	0·1	0·8	0·4	1·2	0·1	0·9	..	0·9	0·3	1·3	0·5	1·2	..	1·1	0·8	1·5

EXPERIMENTS WITH PEAT.

The peat tested was a fibrous material containing, in its air-dried state, 17·03 per cent. of water and 7·94 per cent. of ash. Deducting these constituents, its composition is shown below. On distillation water appeared about 100°, gas at 250°, tar about 325°, sulphur compounds at 375°, and inflammable gas at 400° C. The products per kilo. of air-dried material at different temperatures were—

—	Water, Grammes.	Tar, Grammes.	Gas, Litres.
Up to 250°	91·1	..	3·0
250–300°	56·4	trace	4·6
300–350°	73·7	2·5	11·4
350–400°	44·1	9·6	33·2
400–450°	45·2	31·2	42·0

The total yield of sulphur compounds was 2 grammes. The residue left at 250° was paler than the original peat; that at 300° was dark brown; that at 350° was brownish-black and friable; that at 400° was black and had lost all structure; and that at 450° was a brittle coke capable of marking paper. The specific gravity of the last residue was 1·40; that of the peat itself was 1·38. Per 100 atoms of carbon (as described above), the composition of the peat and of the different residues was as follows:—

	Original.	Up to 250°.	Up to 300°.	Up to 350°.	Up to 400°.	Up to 450°.
Atoms of hydrogen	114·0	120·2	116·2	72·0	74·5	67·2
Atoms of nitrogen	4·5	4·3	4·5	4·4	4·3	4·9
Atoms of oxygen	42·1	42·7	38·6	23·2	18·4	16·8
Atoms of sulphur	0·2	0·2	0·2	0·2	0·2	0·1

The elements present in the original peat were divided thus among the distillates and the residues—

—	Up to 300°.		Up to 350°.		Up to 400°.		Up to 450°.	
	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.
C	0·5	57·8	—	58·3	7·9	50·4	20·6	37·7
H	—	5·5	2·0	3·5	2·4	3·1	3·4	2·1
N	—	3·0	—	3·0	0·5	2·5	1·3	1·7
O	3·0	29·7	14·6	18·1	20·4	12·3	24·3	8·5
S	—	0·3	—	0·3	0·1	0·2	0·2	0·1

The aqueous distillates were clear, pale liquids of strong odours. The first three were neutral, the fourth faintly alkaline, and the fifth strongly so. The first three were darkened in colour by ferric chloride, the fourth was turned red, and the last red-violet; all reduced cold ammoniacal silver solution. The densities ranged between 1·00 and 1·15. The gravity of the bulked sample was 1·01. The second fraction contained neither ammonia nor acetic acid; but both substances were present in all the others. In the higher fractions the ammonia was also partly combined with carbonic acid, while some of it was free. From 100 grammes of the first fraction, 0·25 gramme of ammonia chloride could be prepared. All fractions contained small quantities of pyridine-like bases, creosote oils, and an acid compound of sulphur possessing an extremely unpleasant odour. Catechol was present in the last two.

The tars formed butter-like masses in the condenser of the apparatus, and melted between 35° and 40° C. Their densities were 1·04, 1·04, and 1·01; after being bulked, 1·02. Examined according to Holde's process, the amounts of paraffins found in them were 8·33, 6·92, and 4·11 per cent.; after being bulked, the proportion was 6·37 per cent. The paraffins recovered melted between 65° and 73° C. The combined tar contained 75·35 per cent. of carbon, 10·34 per cent. of hydrogen, 5·14 per cent. of nitrogen, 8·90 per cent. of oxygen, and 0·27 per cent. of sulphur. On distillation 12·9 per cent. passed over between 95° and 200°, 48·0 per cent. between 200° and 300°, 21·7 per cent. between 300° and 360°, while 17·4 per cent. remained in the retort as a black pitch. The last fraction contained so much paraffin as to solidify on cooling. Pyridine-like bases and phenolic bodies were recovered from each fraction by washing with acid or alkali. Phenols boiling between 185° and 285° formed nearly half the fraction distilling between 200° and 300°.

The peat gases were composed as follows:—

	300-350°	350-400°	400-450°
CO_2	89·2	63·8	55·4
C_nH_m	0·3	0·4	3·7
CO	10·1	7·2	12·3
H	0·3	3·1	3·1
CH_4 (only)	—	25·5	25·4

TABLE IV.

—		1.	2.	3.	4.	5.	6.	7.	8.
Composition of the tars :—									
Specific gravity		0·96	0·97	0·96	0·95	0·97	0·98	0·97	1·03
Carbon	per cent.	81·78	84·60	84·91	84·01	84·56	84·02	86·25	88·32
Hydrogen	,,	9·20	8·85	9·65	9·81	9·43	9·34	9·25	7·84
Nitrogen	,,	1 35	1·03	1·60	0·94	0·81	0·94	1·27	1·04
Oxygen	,,	7·05	4·97	3·50	4·36	4·48	4·99	2·67	2·21
Sulphur	,,	0·62	0·55	0·34	0·88	0·72	0·71	0·56	0·59
Distillation tests :—									
Start	C.°	75	65	80	80	80	80	75	115
Up to 150° C.	per cent.	6·3	7·9	5·5	6·5	5·5	6·5	7·5	8·8
Between 150° and 250°	,,	27·3	30·1	31·5	28·1	27·2	27·6	27·2	21·3
,, 250° and 350°	,,	29·0	26·6	34·5	36·3	32·8	30·6	34·6	31·0
Above 350°	,,	30·0	25·9	19·5	20·5	21·3	22·1	21·6	26·5
Pitch and loss	,,	7·4	9·5	9·0	8·6	13·2	13·2	9·1	12·4
Percentage of paraffins		1·7	0·5	1·5	2·1	1·2	1·4	0 3	0·0
Percentage of total phenols		26	22	20	24	20	28	6	4

TABLE V.

—	1.		2.		3.		4.		5.	6.		7.		8.
	400–420°	440°	410–428°	445–450°	400–420°	450°	420–438°	445°	434–440°	435–448°	448–450°	443–446°	446–449°	452–454°
Carbon dioxide	16·1	10·2	7·4	5·5	4·7	3·8	6·6	5·7	5·3	6·0	5·6	15·5	11·2	18·5
Heavy hydrocarbons	13·0	13·1	15·0	10·3	10·1	5·6	14·3	12·1	10·0	9·7	12·0	8·5	6·6	5·9
Carbon monoxide	8·8	6·9	3·5	2·5	3·6	3·8	5·4	4·0	6·2	5·0	3·6	1 8	2·0	2·4
Hydrogen	6·5	8·9	5·0	10·2	7·7	17·3	6·1	6·5	6·0	7·4	9·1	12·8	12·8	13·1
Methane	38·4	35 5	9·9	71·5	45·5	54·3	39·4	71·7	44·2	47·8	69·7	40·1	67·4	60·1
Ethane	17·2	25·4	59·2		28·4	15·2	28·2		28·3	24·1		21·3		
n	—	—	—	1·35	—	—	—	1·38	—	—	1·39	—	1·27	1·22

TABLE VI.

—	1.		2.		3.		4.	5.		6.		7.		8.	
	380-400°	42:–430°	425–440°	445–450°	420–440°	445–450°	443–450°	420–450°	450–454°	440–450°	450–455°	433–445°	445–450°	435–450°	450°
Carbon	0·734	0·723	0·797	0·694	0·730	0·673	0·759	0·669	0·673	0·736	0·725	0·640	0·650	0·593	0·590
Hydrogen	0·170	0·180	0·223	0·231	0·212	0·209	0·215	0·204	0·212	0·204	0·223	0·209	0·210	0·182	0·183
Oxygen	0·340	0·270	0·114	0·077	0·415	0·096	0·167	0·104	0·083	0·171	0·150	0·185	0·145	0·200	0·149
Atoms of hydrogen per 100 of carbon.	278·0	298·7	335·7	393·4	348·6	372·7	339·9	365·9	378·0	332·6	369·1	391·9	387·7	368·3	372·2
Atoms of oxygen per 100 of carbon.	34·7	28·0	10·4	8·3	14·8	10·7	16·5	11·7	9·2	17·4	15·5	21·7	16·6	25·3	18·9

EXPERIMENTS WITH BROWN COAL.

Two different varieties of brown coal were examined; the first being a recent, soft, wet grade of coal coming from Herzhorn i. M., and the second an older, hard, dry material from Karlitz, in Bohemia. The former contained 32·98 per cent. of carbon, 2·53 per cent. of hydrogen, 0·56 per cent. of nitrogen, 21·84 per cent. of oxygen, 1·93 per cent. of sulphur, 33·36 per cent. of water, and 6·80 per cent. of ash in its air-dried condition. On distillation, water appeared at 100°, gas at 210°, sulphur compounds at about 295°, and tar (which solidified immediately) at 350° C. The specific gravity of the original brown coal was 1·37, and that of the final residue 1·55. Calculated per 100 atoms of carbon, the original brown coal (free from water and ash) and the various residues left in the retort had the following compositions:

	Original.	Up to 250°.	Up to 300°.	Up to 350°.	Up to 400°.	Up to 450°.
Atoms of hydrogen	92·1	94·2	94·6	85·0	77·9	61·6
Atoms of nitrogen	1·5	1·3	1·1	1 3	1·3	1·0
Atoms of oxygen	49·7	32·1	27·5	23·1	16·2	5·5
Atoms of sulphur	2·2	2·0	1·9	1·9	2 1	2·0

Allowing for unavoidable errors introduced through the lack of homogeneity, and the instability of the brown coal, the elements originally present were divided among the distillates and the residues somewhat thus:

	Up to 350°.		Up to 400°.		Up to 450°.	
	Volatile.	Fixed.	Volatile.	Fixed.	Volatile.	Fixed.
C	..	55·1	4·5	50·6	10·0	55·1
H	..	4·2	0·1 (?)	3·3	1·9	2·3
N	..	0·9	0·2	0·7	0·4	0·5
O	18·0	18·5	25·5	11·0	33·2	3·3
S	0·1	3·1	0·3	2·9	0·8	2·5

The liquors all had a specific gravity of 1·00, were faintly acid, and gave the green reaction with ferric chloride characteristic of catechol. On working up large quantities of the liquor, catechol was isolated, ammonia and acetic acid were recovered, and an oil was obtained presumably identical with creosote.

The tars rapidly acquired a dark brown colour. They had a wax-like consistency, melting between 30° and 40° C. The densities of the last three fractions were 1·015, 1·001, and 0·979 respectively; that of the bulked sample was 1·009. The paraffins in the same fractions amounted to 10·89, 12·45, and 11·11 per cent.; in the bulked sample, to 12·24 per cent. The melting point of the paraffin ranged from 51° to 67°. The combined tar contained 78·95 per cent. of carbon, 9·98 per cent. of hydrogen, 4·53 per cent. of nitrogen, 5·03 per cent. of oxygen, and 1·51 per cent. of sulphur. On distillation, 3·2 per cent. came over between 170° and 200°, 33·8 per cent. between 200° and 300°, 38·8 per cent. between 300° and 345°; leaving 24·2 per cent. as a semi-carbonized residue. The last fraction solidified on cooling. All evolved sulphuretted hydrogen, and contained small quantities of bases and larger amounts of phenols. The gases gave the following figures on analysis; the first two columns being the gaseous products of distillations carried out by the second operator, as mentioned above:

	350-400°	400-450°	389-390°	400-450°	440 450°
CO_2	56·7	65·9	66·2	52·1	42·6
$C_n H_m$	1·6	2·0	1·3	1·5	4·0
CO	10·9	14·1	15·4	20·0	8·1
H	11·9	5·3	1·5	7·4	19·3
CH_4	18·9	12·7	14·5	18·1	8·0
C_2H_6	—	—	1·1	0·9	18·0

The Bohemian brown coal contained 63·94 per cent. of carbon, 5·05 per cent. of hydrogen, 0·83 per cent. of nitrogen, 21·70 per cent. of oxygen, 0·45 per cent. of sulphur, 1·81 per cent. of water, and 6·22 per cent. of ash. On distillation water appeared at about 200°, gas at above 250°, tar at 330°, and sulphur compounds at about 350° C. The specific gravity of the original material was 1·34; that of the final residue, 1·39. Calculated per 100 atoms of carbon as before, the brown coal and the residues were composed as follows:

	Original.	Up to 250°.	Up to 300°.	Up to 350°.	Up to 400°.	Up to 450°.
Atoms of hydrogen	94·7	93·3	92·7	82·2	61·6	56·5
Atoms of nitrogen	1·1	1·3	1·5	1·6	1·5	1·4
Atoms of oxygen	25·4	22·4	23·6	17·9	9·6	8·6
Atoms of sulphur	0·3	0·4	0·3	0·4	0·3	0·3

The elements originally present were divided between the distillates and the residues thus:—

	Up to 250°		Up to 300°		Up to 350°		Up to 400°		Up to 450°	
	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.	Vol.	Fixed.
C	1·2	68·3	5·4	64·1	7·5	62·0	8·1	61·5	17·0	52·6
H	0·2	5·3	0·5	5·0	1·2	4·3	2·3	3·2	3·0	2·5
N	—	1·0	—	1·0	—	1·0	—	1·0	0·1	0·8
O	3·2	20·4	3·4	20·2	8·8	14·8	15·7	7·9	17·6	6·0
S	—	0·5	—	0·5	—	0·5	—	0·5	0·1	0·4

The aqueous liquors were clear, colourless at first, becoming yellow and brown as the temperature rose. Up to 400° they were strongly acid, afterwards alkaline; all reduced ammoniacal silver solution in the cold. The density of the first four fractions was 1·00; that of the last was 1·005. Much catechol was present in all the fractions above 300°.

The last three fractions of tar had specific gravities of 0·97, 0·98, and 0·98 respectively. The two former were viscid at ordinary temperatures, the last solid. The proportions of paraffins found were 8·89 per cent., 6·29 per cent., and 4·35 per cent.; in the bulked sample, it was 5·04 per cent. The melting point of the paraffin was from 60° to 69° C. The bulked tar contained 73·47 per cent. of carbon, 9·58 per cent. of hydrogen, 1·94 per cent. of nitrogen, 14·75 per cent. of oxygen, and 0·26 per cent. of sulphur. On distillation, 17 per cent. passed over between 90° and 200°, 41 per cent. between 200° and 300°, 34·2 per cent. between 300° and 385°; leaving 7·8 per cent. as a tarry residue. The highest fraction contained much solid paraffin. The tar was less viscid, lighter, and richer in oxygen than that obtained from the Herzhorn brown coal; it also contained much more phenol. Nearly two-thirds of the middle fraction consisted of phenols boiling between 190° and 250°. Half the lower fraction was phenolic, and one-quarter of the higher.

The gases obtained from the distillations performed by the two investigators gave the following analytical figures:

	300°		350°		400°		450°	
CO_2 . .	92·7	91·4	91·0	90·9	55·1	69·6	27·7	47·8
C_nH_m .	0·1	0·7	0·2	1·0	4·9	2·5	2·4	3·9
CO . .	1·2	6·4	4·7	7·6	18·9	15·8	11·6	15·1
H . .	0·5	0·3	0·6	0·5	2·2	8·8	15·0	11·9
CH_4 . .	5·5	1·1	3·4	—	16·0	3·2	38·6	21·2
C_2H_6 .	—	—	—	—	2·9	—	4·7	—

Experiments with Ordinary Coal.

Eight different specimens of coal were submitted to treatment in the apparatus described: (1) A flaming coal from the Hohenzollern mine in Upper Silesia; (2) a gas coal from the Glückhilf mine in Lower Silesia; (3) a gas coal from the Zollverein I-II pit; (4) a flaming coal from the Bismarck pit; (5) a flaming coal from the General Blumenthal I-II pit; (6) a flaming coal from the Heinrich pit of the Neu-Essen Company; (7) a coal from the Shamrock I-II pit; and (8) an "Esskohle" from the Altendorf mine—all from Rhenish Westphalia. The compositions of these coals, and the results obtained on distilling them at a temperature of 450° C., are shown in Tables I. and II. Whenever two different temperatures are recorded in Table I. for the points at which certain products appeared, successive experiments gave different figures due to the heterogeneity of the material. The "total volatile matter (or coke and ash) by ignition" indicates the result of examining each coal according to Muck's crucible test; and the figures in the last line of Table I., therefore, represent the proportion of the total volatile matter driven off at 450° in the author's apparatus. Table III. shows how the total amount of carbon, &c., present in the original coal (after deducting the moisture and ash), which is given in the first five lines of Table II., became divided between the distillation products and the residues on heating the samples to 450° C.

The liquors were slightly clouded, had a specific gravity of 1·0, smelt of sulphuretted hydrogen, and were generally somewhat alkaline. They darkened on exposure to air, and a skin formed upon them. Qualitative tests proved sulphuretted hydrogen, ammonia, organic bases, and phenolic bodies to be present, but no cyanogen compounds. After extracting the phenols with ether, the bases could be recognized by their pyridine-like odour; but aniline could not be detected. Liquor (1) gave a violet colour with ferric chloride; liquors (2) to (6) inclusive gave an emerald-green tint; liquors (7) and (8) gave no particular colour reaction. The violet colour is undoubtedly due to "benzophenol," and the green colour to catechol (the author has already discussed the existence of the latter in coal tar, see *Berichte*, 1902, Vol. XXXV., p. 4324).

The tars were clear, brown liquids, free from carbon, darkening in air, possessing the usual odour, and some of them tending to deposit a few crystals. Their ultimate composition and other properties, also the results obtained on distilling them, are quoted in Table IV. It is interesting to notice how the high proportion of oxygen characterizing coal (1) is reproduced in the tar, but not in the residue remaining after distillation; whereas the deficiency in hydrogen of coal (8) is reproduced both in the tar and in the solid residue. On redistillation the fractions coming over between 250° and 350° from the first seven tars yielded small quantities of colourless crystals, and the higher fractions much larger amounts. The upper fraction of tar (8) solidified to a greenish-yellow honey-like mass. Only a few drops distilled from the tars between 420° and 430°; on slightly pushing the temperature, the pitches began to coke. The paraffins recovered by Holde's process melted between 55° and 60° C. The figures recorded in Table IV. for the total phenols are percentages by volume, obtained by washing the tars with known amounts of dilute caustic soda solution and observing the decrease in bulk.

In order to obtain material for a further examination of the crystals depositing from tar (8), 5-kilogramme batches of the corresponding coal were distilled until 190 kilos had been carbonized at a temperature of 500° C. By repeated fractional crystallizations from absolute alcohol the powder was separated into two hydrocarbons, the more soluble of which formed white plates melting at 203° C., and was identified as the "iso-methylanthracene" already described by the author (*Berichte*, Vol. XV., p. 1821; and Vol. XVI., p. 2610). The less soluble body formed deep yellow plates with a greenish lustre, melting at 309° to 310°, and identical with the crackene, $C_{24}H_{18}$, isolated by Klaudy and Fink from Austrian petroleums (*Monatshefte f. Chemie*, Vol. XXI., p. 118).

A large quantity of tar (1) was washed with dilute soda and then with dilute sulphuric acid. From the acid about 2·7 per cent. of a basic mixture was recovered, which distilled between 175° and 350°, leaving a carbonized residue. The alkaline solution gave on neutralization about 25 per cent. of phenolic bodies distilling between 204° and 380°, and also leaving a carbonized residue. On redistillation the phenols chiefly passed over between 185° and 215°, and a smaller quantity between 285° and 400°. The lower fraction was practically free from phenol itself and from meta-cresol and para-cresol. Fractions distilling between 200° and 205° and between 205° and 210° were found to consist of xylenols. The higher fractions formed soft butter-like masses with colourless crystals embedded; but it has not yet been possible to ascertain their constituents. The neutral oil left after extraction contained benzene and its nearest homologues, but was essentially free from naphthalene and anthracene, and no thiophen could be detected in it. On fractional distillation no solid substance came over below 350°, when the paraffins began to appear. In general, the tars, especially the first seven, showed strong analogies with those produced in Jameson coke-ovens.

In Table V. the percentage composition of the gas obtained at different temperatures is recorded; while Table VI. shows (a) the number of grammes of each element present in each litre of the gas, and (b) the number of atoms of hydrogen and oxygen per 100 atoms of carbon.

LARGE GAS-POWER PLANT IN AMERICA.

According to "Engineering Record" (New York) what will eventually develop into perhaps the largest gas-power plant in the world has its inception in an important contract recently placed with the Westinghouse Machine Company, of Pittsburg, Pa., for eight large gas-driven blowing-engines to be installed in the new steel plant at Gary, Indiana. As it is the expressed intention of the United States Steel Corporation (which controls the Indiana Steel Company) to make this the foremost American steel centre, the significance of the simultaneous development of gas power is obvious.

The machines comprised in this initial order will be uniform in size and capacity. Each gas-engine, as an electric unit, will have a rated capacity, on blast-furnace gas, of nearly 3000-horse power, corresponding to a rating of 4000-horse power on natural gas. The unit will be arranged in twin tandem fashion; each side consisting of two double-acting gas cylinders and one blowing cylinder in the opposed or *vis à vis* arrangement. The power cylinders are 42 inches and the air cylinders 68 inches in diameter, with a common stroke of 54 inches; the unit running at a maximum speed of 75 revolutions per minute for blowing and 84 revolutions for electric work. The capacity of air delivery at this speed will be 33,000 cubic feet of free air per minute at 18 lbs. pressure, with a maximum pressure delivery of 30 lbs. per square inch.

This type of engine will not only be used for blowing purposes, but also for electrical generation. In all sizes, a resemblance to the horizontal tandem heavy-duty steam-engine design is strong. The general design conforms quite closely to that of similar machinery ordered by the United States Steel Corporation for the Carnegie Steel Company's plant at Bessemer, near Pittsburg. It also follows closely, but upon a larger scale, the design of a number of smaller units already in operation in various parts of the country for power work. Some of these smaller plants are operating on natural gas; but with the exception of slightly different proportioning of the air and gas passages and cylinder diameter, the general construction of the natural gas engine is practically identical with that intended for leaner gases, such as producer and blast-furnace gases.

For several months a 350-horse power engine of this type has been in regular operation on blast-furnace gas at the Edgar Thompson works, at Pittsburg, generating electricity for motor-driven foundry machinery. The engine was installed largely for experimental purposes, and has given such excellent operating results that the success of the larger machines may be regarded as assured. At the time of our contemporary writing, this engine was completing a 30-day continuous load and duty test, operating 24 hours per day and seven days per week during the period.

The Bland Light.—In the description of the improvements in the "Bland Light," in the "Journal" for Sept. 11, an error appeared in the concluding paragraph, arising from a defect in the information given to us, on which the article was founded. The result of one quarter's use at St. Pauls Church, Woodford Bridge, showed a saving of 7300 cubic feet of gas, and not £7 3s. in money, as stated.

REGISTER OF PATENTS.

Continuous Carbonization of Coal, &c.

WETTER, J.; a communication from Dr. E. R. BESEMFELDER, of Charlottenburg, Germany.

No. 18,593; Sept. 14, 1905.

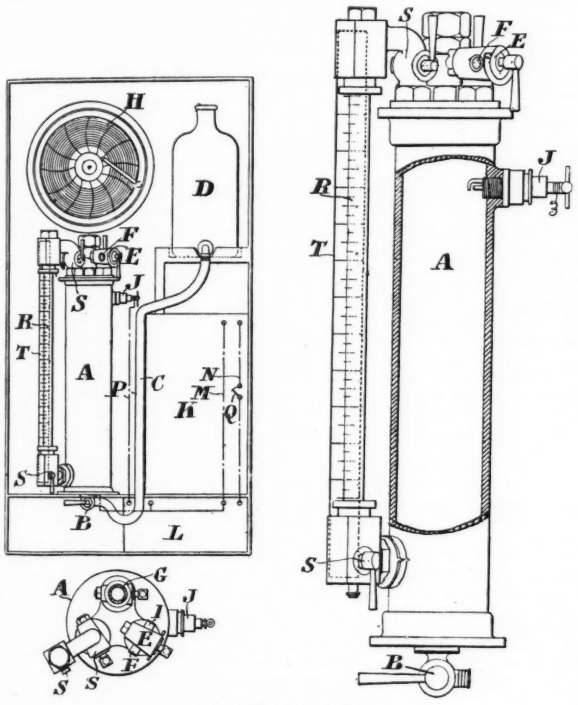
This is a modification of the patentee's earlier invention—No. 13,830 of 1899. The arrangement referred to is explained and illustrated in another column of to-day's issue of the "JOURNAL"—see p. 830.

Gas-Calorimeter.

STOKES, J. W. B., of Shettlestone, and D. STEWART and Co., of Glasgow.

No. 21,872; Oct. 27, 1905.

This is an instrument for measuring, "with much greater rapidity and ease than is possible with apparatus hitherto known, and with accuracy sufficient for practical purposes," the calorific value of combustible gas, and is more particularly intended for use in connection with producer-gas operated gas-engine installations, where the rapidity and ease with which a test can be made are of great value. The instrument comprises a closed vessel containing a liquid unaffected by, and not affecting, the gas to be tested, and which may be displaced to admit the gas (and a due proportion of air) preferably by the movement of a reservoir of the liquid connected by a flexible tube to the vessel.



Stokes' Gas-Calorimeter.

The illustration gives a somewhat diagrammatic elevation of the complete apparatus (enclosed in a case) and a sectional elevation (on a larger scale) of the testing vessel forming part of it.

The vessel A is vertically cylindrical, and is provided with an aperture at its lower end controlled by a stopcock B, connected, by a flexible tube C, with a bottle-like reservoir D, of greater capacity than the vessel A, and open to the atmosphere. At the upper end of A is an aperture controlled by a three-way stopcock E, by which communication may be opened between the vessel and a nozzle I for connection to the gas-main or other source, or between the vessel and a nozzle F, open to the atmosphere. Another aperture is fitted with a coupling and cock, by which there is connected to the vessel a recording pressure-gauge H, of well-known form. At the upper end of the vessel there is an aperture carrying a sparking plug J, operated by current from a primary battery K, through an induction coil L. The negative conductor M of the battery and coil passes from the primary negative terminal of the battery to the primary and secondary negative terminals of the coil, and is then earthed to the vessel A. The positive conductor N passes from the battery positive to the primary positive terminal of the coil. From the secondary positive terminal of the coil the high-tension conductor P passes directly to the insulated terminal of the sparking plug. A switch Q, of ordinary form, is arranged in the primary positive circuit.

A gauge-glass R, capable of being isolated from the vessel by cocks S, is arranged vertically at one side of it, and there is fixed beside the gauge-glass a scale T, graduated to show, by the level of the liquid in the gauge, the volume of gas, or gas and air, in the vessel A.

In operation, the cock E, on the vessel A, is closed to the source of gas to be tested, and opened to the nozzle F, which is open to the atmosphere; and the reservoir D is removed from its shelf and held at such a height that the vessel A becomes filled with the liquid (conveniently, mercury). The cock is then moved to shut the air-nozzle F and open the nozzle I to the interior of the vessel. The reservoir D is next gradually lowered; thus lowering the level of the mercury in the vessel A, creating a partial vacuum, and drawing into the vessel a measured amount, at atmospheric pressure, of the gas to be tested—the amount being shown by the level of the mercury in the gauge-glass R, and read upon the scale T. When the desired amount of gas has been drawn into the vessel A, the gas supply is cut off, the reservoir D lowered further, and the air connection opened. Air is thus drawn in, and the operation is continued until the proper proportion of air relatively to that of the gas to give a proper explosive mixture is attained. The air-nozzle F is then closed, and communication (if it is not already open) opened between the vessel A and the recording pressure gauge H; also, if it be desired that there be any initial pressure upon the explosive mixture, the reservoir D is again raised an extent commensurate with the pressure desired. The cock B, controlling communication between it and the vessel A, and the cocks S, isolating the gauge R, are next closed. But if no pressure be desired, these operations are performed without raising the reservoir D. The electrical circuit is then closed by the switch Q, and the charge within the vessel is ignited by the spark between the terminals of the sparking plug J; the pressure due to the explosion of the charge being recorded by the pressure gauge H. From this pressure with the proportions, volume, temperature, and initial pressure of the mixture as factors (which may be made constants), the calorific value of the gas can be easily arrived at. The products of combustion are then expelled by raising the reservoir D—the air-cock F having first been opened; and the instrument is ready for another test.

Pilot Burners for Incandescent Gas-Lights.

GODSON, R. S., of Paignton.

No. 6111A; March 18, 1906.

This invention is designed more especially for use in connection with the three-way gas-tap referred to in patent No. 6111 of 1906 [see *ante*, p. 248], and has for its object to provide means whereby the gas from the bye-pass is made to percolate through asbestos "so that there will be only a small incandescent constant and regular glow, which will ignite the main flame and at the same time obviate corrosion of the bye-pass—a frequent cause of trouble with bye-pass arrangements hitherto constructed."

It is known, says the patentee, that auxiliary burners have been used provided with an incandescent or refractory filling arranged within the chamber provided by the metallic foraminous jacket, and which material is subjected to the flame of the auxiliary burner so as to be maintained in a state of incandescence or at a red glow, but "sufficient to instantly ignite the gas issuing from the main burner, and to relight the auxiliary burner should its flame become accidentally extinguished." The patentee does not make any general claim for such an arrangement; but what he does claim is a thimble screwed on to the flattened end of the bye-pass tube and lightly packed with asbestos, so as to allow the bye-pass gas to percolate through it, and thus provide a steady incandescent glow to light up the main flame when the tap is turned to the 'on' position."

Igniter for Street Gas-Lamps.

LENTSCHAT, G., of Hohenschönhausen, near Berlin, and DRAHONOWSKY, W. J., of Miröschau, Bohemia.

No. 8792; April 11, 1906.

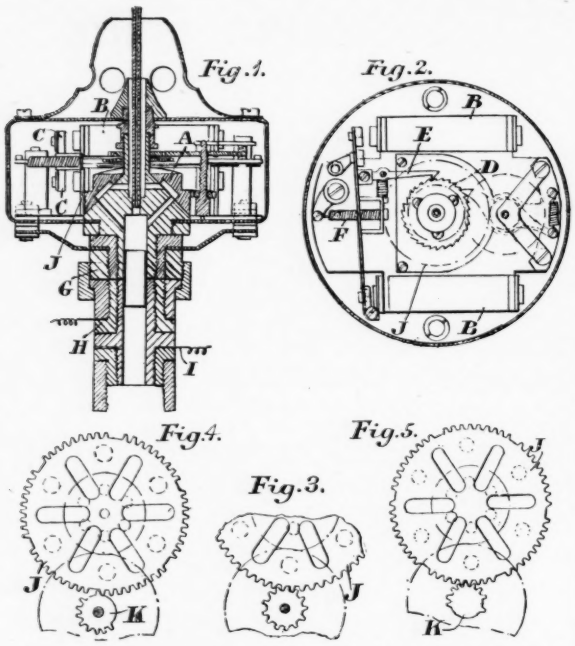
This invention relates to street-lamp igniters in which the gas-passages leading to the burner are alternately opened and closed by a rotary body actuated by electricity. This rotary body is not (as hitherto) actuated directly by the electric device, but indirectly—intermediate gear being employed, which, with a certain number of circuit-closings, leaves the rotary body uninfluenced. It is thus possible, by the employment of a single electric conductor, to ignite a number of gas-flames simultaneously and extinguish them in groups.

Fig. 1 (p. 842) is a section of a device furnished with a burner. Fig. 2 is a section through X—Y in fig. 1. Fig. 3 is the tooth gear for simultaneously igniting and extinguishing gas flames. Figs. 4 and 5 represent the tooth wheel gear for the simultaneous ignition and the extinction of gas-lamps in groups in the relative positions of the tooth segment and the rotary body for simultaneously igniting the lamps or extinguishing them in groups.

The cock closing device consists of a casing bored to communicate with the gas supply, and of a rotary body—a movable annular piece A, ground gas-tight on the casing. From the boring in the casing a central passage branches off, through which the gas-igniting pipe runs to the head of the burner and to a series of six obliquely situated passages. Above these are six horizontal radial passages, connected by a channel and communicating with the gas supply pipe leading to the burner. The annular piece A is formed with six oblong incisions, in order that, when the cock is opened, the two series of borings or passages may be in communication and convey the gas to the burner.

The electric device is composed of two pairs of electro-magnets B, with arms in proximity to one another, and a divided armature C, both parts of which are on the same shaft. One part consists of two pieces of metal connected together by iron crosspieces; the other (which moves between these likewise on the shaft) consisting of a piece of metal with a U-shape bend and a cross piece.

The device, which transmits the motion of the armature to the annular piece A and enables it to be adjusted, consists of a locking wheel D, actuated by a locking hook or pawl E to the extent of one tooth after each closing of a circuit, and of intermediate tooth gear. In the middle part of the armature (in the U-shape bend) a spiral spring F is arranged, the other end of which is fixed to a column. The middle part of the armature is shorter than the parts enclosing it, in order that, when the armature is attracted, it can swing out freely, and the locking wheel D may be uninfluenced by the striking of the armature on the core of the magnet.



Lentschat's and Drahonowsky's Street-Lamp Igniter and Extinguisher.

The movement of the armature locking hook E on the annular piece A is effected by means of the locking wheel D and the tooth wheels. The first tooth wheel is firmly connected with the locking wheel, and is rotary around the extension of the fixed cock casing; tooth wheels two and three are firmly seated on a rotary shaft; while the fourth tooth wheel is connected with the annular piece A, or cut out of it.

One wire end of each of the two electro-magnets is connected with the casing; the other two with insulated terminals. These terminals are connected by metal strips with the screw device G and the working wire H, while the shunt wire is connected, through the casing, with the conductor I.

If a number of gas-lamps are to be ignited or extinguished simultaneously, the tooth wheel gear shown in fig. 3 is employed. This differs from that illustrated in figs. 4 and 5 by the wheel J being furnished with teeth on its circumference. Thus, if the locking wheel D is actuated by a number of circuit closings, the motion of the wheel will be transmitted to the annular piece A simultaneously by the tooth wheel gear, and thereby the gas-passage in the cock be gradually opened and closed by the annular piece. If, however, a number of gas-lights are to be ignited at the same time, but extinguished at different times (as will evening and night lamps), two special sets of conductors must be put on when the device is employed.

If by means of a suitable number of current closings (in the form illustrated, fifteen are necessary) the tooth wheels are rotated to the extent of one third of their circumference, the wheels J of the annular pieces are rotated so that the incisions in the annular piece and the passages in the cock casing are one above the other and coincide. The gas thus reaches the burner, and is ignited by the day flame. Evening and night lamps burn simultaneously. When fifteen further circuit closings have been effected, the annular piece shown in fig. 4 is further rotated, and comes into the position it occupied before the lamps were ignited; thus shutting off the gas again. All lamps are thus extinguished. In fig. 5, the motions of the armature are without effect in relation to the relative positions of the annular piece and the cock casing, as the large gap K passes by the tooth wheel J of the annular piece without further actuating it. The group of lamps would thus remain burning (night lamps) when this second series of circuit closings was effected. With repeated circuit closing, the places free from teeth in the large wheel adjusted according to fig. 4, move past the wheel J of the annular piece A without actuating it. The cocks thus remain closed. In the case of the large wheel adjusted as in fig. 5, the tooth wheel J brings the annular piece into the shutting-off position. The cocks are thus closed, and evening and night lamps extinguished.

APPLICATIONS FOR LETTERS PATENT.

20,117.—Hügle, O., "Ring for economizing gas in gas-cookers." Sept. 10.

20,227.—Lange, G., "Measuring the flow of liquid in pipes." Sept. 11.

20,244 —Cox, H. W., "Gas and other taps." Sept. 11.

20,301.—Bugden, T., Martyn, H. C., and Arbon, A., "Gas-main bags." Sept. 12.

20,325.—Ludbrook, S. W., and Cole, W. L., "Retort discharger." Sept. 12.

20,326.—Lentschat, G., and Drahonowsky, W. F., "Lighting and extinguishing street or other gas-lamps from a central station." Sept. 12.

20,357.—Hartley, W., "Inverted burners." Sept. 13.

20,359.—Fritz, F., "Producing gas and its bye-products from coal, peat, and similar substances." Sept. 13.

20,454.—Green, B. K., "Producing gas." Sept. 14.

20,484.—Masons Gas Power Company, Ltd., Hollis, A., and Wright, T., "Power-gas producers." Sept. 15.

20,546.—Holzwarth, H., and Junghans, E., "Gas-turbines." Sept. 15.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Improvements in Gas-Stoves.

Sir,—Now that we have gas-fires with ventilating arrangements and gas and air adjusters, we have got a little nearer perfection. I have had lots of trouble on account of the absence especially of an air-shutter on gas-fires, and have frequently stuffed up the air opening in the bunsen with steel-wool, which I found useful for the purpose.

Another difficulty I often meet with in gas-stoves which have no back-plate attached, is that the current of air under the stove making for the flue is so strong as to carry quite past the bunsen burner—in fact, the current is often so strong under the stove as to, "instead of supplying air," rob it entirely of its air supply; and I have had to put a sort of baffle-plate to catch the current of air and give it a chance of going where it was wanted. All stoves without a back should have a plate at the back of the air opening into the burner, so as to scoop in (as it were) some air for the burner.

How often do fitters in fixing gas-fires fix the tap in a convenient position—say, near under the side of the mantle shelf, for convenience at least in regulating and extinguishing? Such an arrangement is certainly a great convenience, and tends to economy and easy regulation. Which firm, I wonder, will be the first to fit a bye-pass to a gas-fire, which for intermittent use during the daytime—as in offices and waiting rooms—would be a convenience? The firm to adopt the suggestion can, if they care, give credit for the tip to

A. E. C.

Leeds, Sept. 20, 1906.

The Exhibition at Limerick.

Sir,—In your issue of the 18th inst. I find a letter on the above, signed "An Irish Gas Manager." Now, I do not, as a rule, take notice of anonymous letters; but in this case I consider it my duty to remove the stigma placed upon the Munster and Connaught Exhibition which is now open in this city.

In the first place, will you kindly permit me to say that it is not a gas exhibition, but an exhibition of purely Irish industries; and it was definitely decided, before opening, not to admit any exhibit of any goods manufactured out of Ireland. The makers of the two gas-engines on exhibition—one driven by coal gas and the other occasionally driven by suction gas—were only permitted to exhibit on condition that they supplied electricity throughout the exhibition free of all cost to the promoters. The single firm of gas-stove makers holding a space were also admitted only on condition that they supplied cooking and heating stoves and gas-boilers, &c., for the use of the restaurant and offices free of all cost. Several very noted makers of gas-fittings, meters, lamps, and engines also made application for space to exhibit their goods, but were refused on account of their not being manufactured in Ireland. The exhibition is purely a private venture of a few enterprising gentlemen in the city, and great praise is due to them.

I regret, however, to find that the "Irish Gas Manager" in question has not confined himself to the truth when he states that half-a-dozen incandescent burners "with broken mantles," lighted a stand belonging to one firm of gas-stove makers. This is absolutely false. On the opening day (July 9), the supply of electricity was very uncertain, and I caused six Welsbach incandescent burners to be fixed at the gas-stove maker's stall; and the same six mantles are still to be seen in use, and in perfect order. Possibly the adjoining exhibits—viz., J. J. whisky or Guinness's stout—affected "Irish Gas Manager's" vision, especially so in his railway tale; but in future I trust, when in search of knowledge, he will try to obtain it from some reliable source, and, above all, confine himself to the truth.

H. Hawkins,
Engineer and Manager.

City Gas-Works, Limerick, Sept. 20, 1906.

The Dublin and Manchester Exhibitions.

Sir,—The remarks which you made in your leaderette of this week with respect to the proposed Gas Exhibition at Manchester can hardly be allowed to pass without comment, particularly as the interpretation which you put upon the decision of the Manchester Institution may easily mislead in one or two instances. You say that the scheme of the Manchester Institution "has been held in abeyance." That is not true so far as it affects the decision of the Dublin Gas Company to have a Gas Section at the Irish International Exhibition. There has been continuity in the furtherance of the scheme since February last, whereas the first mention of an exhibition at Dublin was, if the writer is correct, the intimation given at the meeting of the Institution of Gas Engineers four months later.

Again, you say that no hint was given at the meeting of the Institution of Gas Engineers of an exhibition being held at Manchester next year. The writer ventures to think that it would have been considered, and rightly so, an impertinence for any of the members of the Manchester Institution to have put forward the question of an exhibition at Manchester as affecting in any way the matter which was then under discussion—viz., whether the meeting of the Institution of Gas Engineers should, or should not, be held in Dublin.

Your further remark that the plans of the Manchester Institution do not comprehend anything of a very ambitious nature may be a correct interpretation of your editorial opinion, but is not exactly in accord with the ideas of the Sub-Committee deputed to carry out the arrangements; for the length of ambition is not measured by the mere floor-space of the exhibits.

It is unfortunate, too, that you should make the statement that "it is inevitable that one must damage the other." There is no need for hysteria of this character, as very few people in the Manchester district believe that the exhibition there will suffer through the Dublin Exhibition; and it is equally incomprehensible why the Manchester Exhibition

should in any way injure the one held at Dublin three or four months before, and serving as it does an entirely different area from the trading firms' point of view. If any firm decides not to exhibit at Dublin, let it be at once understood that it will not be because there is an exhibition at Manchester, but because they consider the expense of an exhibition at Dublin will not be warranted by the subsequent orders to be expected as a result. We at Manchester do not mind the Dublin exhibition; and since, according to your dictum, Dublin has first claim (and certainly they have the first pick of the orchard so far as time is concerned), surely our Dublin friends do not mind us!! There is ample room for both.

Gas Offices, Longwood, Sept. 20, 1906.

JNO. HY. BREARLEY,
President, Manchester District Institution of Gas Engineers.

[In dealing with the letter from the President of the Manchester Institution, it may, in the first place, be suggested that Mr. Brearley's mind must have been extraordinarily clouded at the time he read the paragraph in last week's "JOURNAL" for him to have fancied he traced in its calmly written sentences anything approaching "hysteria." He now criticizes phrases, muddles up meanings, acknowledges his ignorance of the promoting work before June in connection with the Dublin Exhibition, and refrains from recognizing our honest desire that both the Dublin and the Manchester Exhibitions may be successful. We want them to be, to the fullest extent that could be desired by the best-intentioned of our friends of the Manchester Institution. There is ambiguity in Mr. Brearley's reference to the "interpretation" we put upon the decision of the Committee of the Manchester Institution; for we have no knowledge of having given to it any "interpretation." The decision itself is clear enough without. It is a very sad confession of being "behind the times" in the news of the gas industry when Mr. Brearley says that the first intimation—he saves himself from the charge of misstatement by the qualifying words "if the writer is correct"—of an exhibition in Dublin was made at the meeting of the Institution in June. In our issue for Jan. 9 last, a paragraph appeared (p. 94), which stated that the exhibition which it was proposed to hold in Edinburgh next year has now been postponed until 1908 in consequence of the strong representations made by the Dublin Exhibition Committee as to the injurious effects that would result from the holding of the two exhibitions the same year. In an article in the "JOURNAL" on March 20, the scope of the Dublin Exhibition was set forth—including mention of a Gas Section and the appointment of a Committee; and the references prior to the Institution meeting as to what was being done in promoting the Gas Section of the Exhibition were fairly frequent. The proposal for the Manchester Exhibition being held "about October, 1907," was only publicly launched by Mr. Kendrick's letter dated Sept. 11. Mr. Brearley belittles the Manchester Institution, as well as the third paragraph of his letter by the use of the word "impertinence" in the second paragraph. It was distinctly understood at the meeting of the Institution that the visit to Dublin next year was in consequence of the exhibition; and with the representation of the Manchester Institution on the Council of the central Institution, it would not have been "impertinence" to have thrown out a hint as to the Manchester Gas Exhibition being also an event of 1907. The Institution, as a body, would probably have declined to bind themselves twelve months ahead to visit Dublin, if they had been made aware of anything happening that held the possibility of exerting an adverse influence on the success of the exhibition. As to the third paragraph of the letter, the allusion to the words "ambitious nature" is completely explained, as readers who have any care about the matter will see, by the succeeding lines of our note in last week's issue, which lines show correctly the limits of the plan for the exhibition, as distinct from the ambition that exists for effect from it. In his concluding paragraph, Mr. Brearley draws conclusions from a very narrow point of view indeed. The exhibition in Dublin may be there three or four months before the Manchester one; but it will not terminate three or four months before the time proposed for that at Manchester. Whatever Mr. Brearley in his beautiful optimism may think, the manufacturing firms of the gas industry are not so fond of gas exhibitions that they care for the trouble, expense, and worry of them on a large scale twice in one year. The breezy remark that closes our correspondent's letter, that "there is ample room for both" exhibitions, is true. But the existence of ample room is one thing; the filling of it another. And it is our belief that both spaces would have been better filled if a little more time could have intervened in the work of promotion. However, we sincerely hope that, in the result, we shall be able to report complete success in both cases.—ED. J.G.L.]

The "Blending" of Producer Gas with Coal Gas.

Mr. R. BRUCE ANDERSON desires us to say that he intends dealing with the points raised by Dr. Colman in the article published in the "JOURNAL" last week, which have a bearing upon the Presidential Address that he (Mr. Anderson) recently delivered to the Irish Association of Gas Managers. He has been indisposed for a day or two, and therefore has delayed sending his communication. He hopes, however, to forward it in time for publication in our next issue.

MISCELLANEOUS NEWS.

GAS SUPPLY IN AUSTRALIA.

The annual meeting of the South Australian Gas Company was held at the offices in Adelaide on the 30th ult.; and the report of the Directors and the accounts for the year ending June showed that, after paying the usual dividends, writing off £2766 for depreciation of plant, and adding £4000 to the reserve fund, the balance carried forward had been increased to £26,498. There was a considerable increase in the quantity of gas sold at the Brompton works, and a slight improvement at all the other stations except Gawler and Strathalbyn. The number of premises in Adelaide fitted with prepayment installations, which has been steadily growing for some time past, has now reached about 2600; while the greater number of gas-stoves sold during the past year indicates that the advantages of cooking by gas are much appreciated by householders. Additional mains have been laid across the Hindmarsh Bridge, and in the southern suburbs. At Port Adelaide a new scrubber-washer is being fixed; and a liquor tank is being built. At Glenelg, new condensers and purifiers have been fixed, and a new meter-house built. A contract has been entered into with the Corporation of Kensington and Norwood for the supply of gas to the street-lamps for seven years from Jan. 1 last. The amount received from sales of gas, residuals, &c., was £99,032; while the expenditure was £63,684.

The report which was submitted at the half-yearly meeting of the Brisbane Gas Company (held on the 3rd ult.) stated that there was a net amount to the credit of profit and loss, including a balance from the previous half year, of £12,520. From this the Directors recommended the payment of a dividend of 5 per cent., which, with the tax, would absorb £8400, and leave a balance of £4120 to be carried to the next account. An extension of the contract with the Brisbane Municipal Council for street lighting has been completed. The receipts from sales of gas, &c., during the half year to June amounted to £21,535; while the expenditure figures at £12,934.

ILFORD GAS COMPANY.

The Ordinary Half-Yearly General Meeting of this Company was held at the works, last Thursday week—Mr. WILLIAM ASHMOLE in the chair.

The CHAIRMAN, in moving the adoption of the report and accounts, said the Directors felt that the results achieved during the half year had been most gratifying, and afforded ample grounds for congratulation, not only to the proprietors, but also to those responsible for the conduct of the business, and to the consumers, who would very materially benefit by the substantial reduction in the price of gas the Board had been enabled to announce. In making this concession, he felt sure the stockholders would agree that the best interests of the Company were being served; and coming as it would soon after the opening of the new show-room, it should go very far to stimulate and strengthen the business, and command alike the respect of their opponents and the confidence of their friends. He might add personally that he hoped before another reduction in the price of gas was made, an increased dividend might be declared. The new, and much-needed, offices and show-room in the Broadway were now nearly completed, and would shortly be ready for occupation. The accommodation afforded by the latter would enable the Company to practically demonstrate the many ways in which gas might be economically used under modern conditions; and steps were being taken to ensure such an exhibition of gas stoves and other appliances as would satisfy the needs of the inhabitants of Ilford, both from an artistic and from a utilitarian standpoint. Turning again to the report and accounts, a satisfactory increase was once more shown in the volume of gas sold, as compared with the corresponding period of last year. No indication was at present shown of any falling off in this respect, and during the half year 614 new consumers had been supplied with gas and 591 additional cookers fixed. The unremitting vigour with which the uses of gas were brought to the notice of prospective consumers was strongly emphasized by the return before the proprietors, and also by the fact that in many important instances electricity had been ousted in Ilford, after trial over considerable periods, in favour of gas. This alone spoke volumes for the future of the undertaking; and he was confident that, not only would the position of the Company be maintained, but every year would consolidate and strengthen this position, to the mutual advantage of the proprietors and their customers. An advantageous contract had been recently secured for the supply of gas to Claybury Asylum; and arrangements were in progress which would enable this to be commenced at an early date. A considerable volume of gas would be required annually; and the manufacturing plant being capable of meeting a largely increased demand without further material capital outlay, an increase of this magnitude must necessarily have the effect of cheapening the cost. When the next reduction took effect, the price of gas at Ilford would have decreased by 11d. per 1000 cubic feet since 1901; and 7d. of it had been due to the working of the last three years, under their present able Engineer, Mr. A. A. Johnston. This was no mean achievement for an undertaking the size of theirs; and the balance-sheet bore striking testimony to the wisdom of the policy adopted by the Company of supplying gas at the lowest possible rates—thus retaining old consumers and enabling keener competition to be maintained with rival illuminants, with the result that the solidity of the business had been permanently benefited and its future assured. The working results of the half year were the best in the history of the Company. To this must be largely attributed the excellent balance carried to profit and loss account; and he might say that the general results compared most favourably with those of other companies. With a view to showing the progress made during recent years, he had taken figures from the balance-sheets of 1902 and subsequent years, and compared them with those of the one now before the proprietors. A striking

feature of the comparison made was the great reduction exhibited in the ratio of capital expended to output of gas. The amount of capital invested per million cubic feet of gas sold was nearly 33 per cent. higher at the end of 1902 than it was now; and there was every reason to believe that this satisfactory state of affairs would continue, bringing with it prosperity to the Company and cheaper gas to the consumer. Another very satisfactory feature was a remarkable reduction effected in the cost of manufacture, amounting to practically 42 per cent. in 3½ years; and it was interesting to observe the steady and continuous progress made in this direction. In 1902, the charges under the heading of manufacture amounted to £133 per million cubic feet of gas sold; in 1903, this was reduced to £119; in 1904, to £110; in 1905, to £101; and the present balance-sheet showed a still further reduction to £94. Such figures spoke volumes for the zeal and efficiency of the Company's staff throughout. The results given were chiefly attributable to improved carbonization methods bringing about much higher production of gas per ton of coal. It was not, however, to the retort-house alone that they must look for substantial improvement—it was indicated in every department, and new appliances had been adopted and modern methods employed with excellent results. With regard to coal, they were fortunate in securing their contracts for the current year without any advance on last year's prices.

The report and accounts were adopted; and a dividend for the half year of 6 per cent. per annum on the "A" and "C" stocks and 4½ per cent. per annum on the "B" stock (less income tax) was declared.

GAS AND WATER PROFITS AT LEICESTER.

At to-day's meeting of the Leicester Town Council, the Gas and Electric Lighting Committee will report that the accounts of the gas undertaking for the half-year ending June 30 last have been submitted to them, from which it appears that the net profit, after paying interest on the capital of the undertaking, is £27,491. Out of this has been paid £7340, being the half-year's amount of sinking fund, leaving a balance of £20,151. The Committee will recommend that out of this amount a sum of £5000 be placed to the reserve fund, and that the balance be applied at the end of the financial year, March 31 next, as the Council may (under their Acts of 1878 and 1884) direct.

The Committee will also state that the accounts of the electric lighting undertaking show that the result of the working of this department for the half year to June is a net profit, after paying interest on the capital of the undertaking, of £6058. Out of this has been paid £3344, the half-year's amount of sinking fund, leaving a balance of £2714, or a total profit on the working of the undertaking for the past six years of £4515. Certain items of capital expenditure during the half year, amounting to £4153, and the cost of obsolete meters, less the amount realized by their sale, £283, have been defrayed out of the accumulated profits, leaving a balance at credit of £79.

The Water Committee will report that the accounts of the undertaking for the six months ending June show a net profit, after paying interest on the capital of the undertaking, of £11,319. Out of this sum has been paid £3543, the half-year's amount of sinking fund, leaving a net balance of £7775. The Committee propose, at the end of the financial year, to carry this balance to the credit of the Special Water Fund which has been created under the authority of section 164 of the Derwent Valley Water Act; and they will recommend the Council to approve this course.

THE QUESTION OF BANK OVERDRAFTS.

Carlisle Water-Gas Plant.

Carlisle is one of the places where the powers that be have had recourse to bank overdrafts to meet deficiencies in the borough fund; and on these amounts interest has to be paid. Recent judgments affecting the Tenby and Southampton Corporations, however (to which the attention of the Finance Committee was called by the City Treasurer and the Auditors), have made the Carlisle Corporation anxious to ascertain how they themselves stand with regard to their overdrafts. As a result, the Town Clerk (Mr. A. H. Collingwood) has prepared a report, in which he deals at length with the judgments referred to, and indicates the differences between those cases and that of Carlisle. His views as to the position of Carlisle, he sets forth as follows: Dealing with the accounts of the Corporation, with regard to the district and city fund accounts at certain times during the statutory periods for which the general district and city rates respectively are made, and until a sufficient collection can be made to meet the current expenditure of the Corporation, a temporary overdraft on these funds is impossible to avoid; and as proper provision is made for the payment of bank interest by the inclusion in the estimates of a sum for that purpose, there can be no objection, as was pointed out by Mr. Justice Channell in *Smith v. Southampton Corporation*, to such temporary overdrafts being obtained as may be required from time to time to meet the daily necessities of the Corporation. With regard to the electricity account, express provision is made by section 52 of the Carlisle Provisional Order that any deficiency in income in any year shall be charged upon and payable out of the city fund; and this has hitherto been regularly done at the close of each financial year. With regard to the gas-works current account, until a sufficient collection of the accounts in any current half year is made, a temporary overdraft to meet the current working expenses is unavoidable; and any bank interest which may be paid in respect of any such temporary overdraft is part of the current expenses of working the undertaking, and payable out of the rents and profits as provided by section 43 of the Carlisle Gas Act, 1850. With regard to the cost of the installation of the water-gas plant, for which borrowing powers are not allowed by the Local Government Board, by section 43 of the Carlisle Gas Act, 1850, it is quite competent for the Corporation to appropriate the rents and profits of the gas-works after meeting all current expenses, including the repayments of principal and interest on loans, in improving and enlarging the gas-works; but whether they do so wholly out of the rents and profits of any one year, or by spreading the expenditure in any exceptional case (such as the water-gas plant for which borrowing powers could not be obtained) over a short period of years, is a question of policy to be determined by the Council in the management of the works. No question of law appears to be involved as long as such expenditure is met out of the rents and profits as provided by the Act, and not out of such revenues of the Corporation as may be subject to statutory restriction.

GAS SUPPLY OF FRANKFORT-ON-THE-MAINE.

A further stage has been reached in regard to the gas lighting question at Frankfort-on-the-Maine, to which reference was made in the "JOURNAL" for Sept. 4. It was then announced that the Frankfort Gas Company had given notice to terminate their gas lighting contract in May, 1911, and the Imperial Continental Gas Association have followed with a similar notice in regard to street illumination, although this action does not interfere with the Companies' right to operate gas-works and utilize the public streets and places in connection therewith until the expiration of the 1864 concessions in 1959.

It is stated, with special reference to the English Company, that their concession will lapse on Sept. 30, 1959. The Company have not an exclusive right to the production of gas, or of definite kinds of gas, or to carry on a lighting business; but they are permitted, during the whole period of the concession, to proceed with such works in the public streets and the town limits of Frankfort and Sachsenhausen as are necessary for the purpose of private lighting, and to undertake supply to private consumers. The introduction of any gas other than coal gas is not allowed except with the consent of the municipal authorities. The Company are prohibited, except with the previous sanction of the town authorities, from transferring their rights or liabilities to any one, either as a whole or in part. Certain normal prices are fixed for the supply of gas; but if they are reduced without the permission of the municipal authorities, the prices cannot be again raised during the whole period of the concession without the authorities' consent.

The question of the future gas supply was brought forward at meetings of the Frankfort Municipal Council on Sept. 5 and 12. On the former occasion, a private motion was submitted in favour of requesting the "Magistrate" to take the necessary steps in order that a municipal gas-works should be brought into operation on the expiration of the two lighting contracts in 1911 for the purpose of public and private lighting, and that a scheme having this object in view should be placed before the Council. It was explained, on behalf of the Magistrate, that, in forwarding the notices, both the Companies had expressed their readiness to enter into negotiations with the Town Council. The expiration of the contracts, however, would not in any way end the relations existing between the Companies in regard to Alt (Old) Frankfort and Sachsenhausen. On the contrary, there would again come into operation section 59 of the concession granted to the Companies, exactly as it was in force until the year 1885. As a consequence of the collapse of section 15, the concession tax payable by the two Companies, according to this paragraph, would also drop. But the Companies were, as hitherto, under the obligation to carry out the public street lighting on the basis of the existing regulations, and the notices also did not apply to Bockenheim and Oberred. On the other hand, the obligation on the part of the Town Council not to erect gas-works in Alt Frankfort and Sachsenhausen came to an end.

It was further stated, on behalf of the Magistrate, that the problem, as set forth in the explanation already given, was rather involved, and required very cautious treatment on the part of the municipal authorities; and in the circumstances the motion was postponed for a week. At the second meeting, the author of the motion and his colleagues submitted that, as the erection of municipal gas-works would occupy a period of from three to four years, it was urgent to deal with the question without delay. As both Companies were ready to enter into negotiations, it was contended that the adoption of the resolution would pave the way for the purpose of deliberations. As, however, the Magistrate was not prepared to take up a definite position in regard to the matter, the proposers of the motion withdrew it, with the observation that if no further steps were taken in the course of the next few months, they would bring the subject forward again.

Public Gas-Works Inspection at Wokingham.—Wokingham is one of the places where the desirability has been recognized of doing what is possible to interest the ratepayers in the municipal gas-works; and with this object in view, it was announced that the works would be thrown open to the public from three to four o'clock last Wednesday afternoon. A number of ratepayers took advantage of the opportunity thus offered of seeing for themselves what a valuable asset the town possesses in its gas undertaking. The Engineer and Manager (Mr. Francis H. Wood) acted as guide, and by his clear explanation of the process of gas manufacture enabled his hearers to grasp the functions of the different plant which they saw.

Sale of Coke at Bingley.—The plan of contracting for the sale of coke in considerable quantities to persons outside the district, which has for the past three years been adopted by the Bingley Gas Committee, has led to the complaint that the charge to residents has been maintained at a higher figure than before, owing to there being no longer any necessity to lower prices for the sake of getting rid of stock. The matter was brought before the Urban District Council; and the Gas Engineer (Mr. Harold Smith) was instructed to make out a statement showing the difference in the returns from the two systems. He reported that the present plan showed an advantage of £600 over the other; and consequently the Committee recommended the continuance of outside contracting. When this came before the Council, however, an amendment was carried, by the casting vote of the Chairman, referring the matter back to the Committee, with an instruction that information should be given to the members of the manner in which the figure quoted had been arrived at.

LIVERPOOL AND THE BIRKENHEAD WATER SUPPLY.

The Proposed Agreement Rejected.

In the "JOURNAL" for Aug. 28 (p. 595), there was reported a meeting of the Birkenhead Town Council at which an agreement for a supply of water from the Liverpool Corporation was provisionally adopted. Last Wednesday, the Liverpool City Council held a special meeting to discuss the same matter, and, after exhaustively considering all the circumstances, rejected the agreement by an overwhelming majority.

The Chairman of the Water Committee (Alderman W. J. Burgess), who moved that a supply of water should be given to Birkenhead on the terms embodied in the agreement, said that the first point to be considered was whether the water resources of Liverpool were sufficient to meet the additional demand that would thus be thrown upon them. Taking all the conditions into account, he thought there could be little doubt that, on a very low estimate, they had really a surplus of not less than 15 million gallons a day; and when the third pipe-line from Vyrnwy was laid, the surplus over present requirements would be more than 30 million gallons a day—that was to say, double the present consumption from all quarters. As to the terms upon which it was proposed that Birkenhead should be supplied, the first clause in the agreement brought Birkenhead into the Liverpool water area on the same terms as Bootle; and the charges to be made by the Liverpool Water Committee in Birkenhead were to be exactly the same as those made in Bootle. They differed slightly from those in Liverpool, in respect of the 3d. rate which was to be charged for sanitary purposes. Against this it was urged that, while it was not unreasonable to offer to supply water in bulk to Birkenhead at a fixed price per 1000 gallons, leaving the distribution to Birkenhead and making an arrangement for a limited period, they ought not to undertake a supply permanently. He had only to say that the representatives of Birkenhead had made it quite clear that any arrangement, whether the supply was to be given by measure or by administration, must be of a permanent character. They felt that the time had come when, from one source or another, a permanent supply for Birkenhead must be secured; and that unless Liverpool was now prepared to give such a supply, Birkenhead must look elsewhere for it. Having pointed out that no obligation was imposed on the Corporation of Liverpool to acquire the West Cheshire or Wirral Water Companies, or any portion of their area, he said that the third clause of the agreement provided for the laying of a main, capable of delivering 5 million gallons daily to join the Vyrnwy main with Birkenhead; and unless the two Corporations mutually agreed to extend the period, it was to be laid within five years of the passing of the Act sanctioning the agreement—roughly speaking, six years from the present time. The cost of this main was estimated at £100,000 or less; and it would be borne by the Liverpool Water Authority, of which at that time Birkenhead would form a part. The only obligation regarding the supply of Vyrnwy water was that which made it incumbent upon them, while the existing Birkenhead wells continued to be used, to supply a million gallons of Vyrnwy water daily; and this could be done at present quite easily through the Wallasey main, which was utilized to only about one-fifth of its capacity. This pipe was capable of delivering something like 2½ million gallons daily, while Wallasey only took half-a-million gallons, so that the margin of a million gallons in addition to the million gallons for Birkenhead was far more than Wallasey was likely to take for years. The amount required for interest and sinking fund on the main was estimated as £5600. The fifth clause of the agreement provided that on the Liverpool water area being extended to Birkenhead, £50,000 should be paid by Liverpool—of course, out of the water account—to the Birkenhead Corporation towards the payment of the Birkenhead water debt, or, as an alternative, that Liverpool would take over the liability for the discharge of this amount of debt. He was aware, of course, that this proposal to take over £50,000 of the Birkenhead water debt had been criticized; and he confessed that they did not agree to it on the Water Committee without considerable hesitation. He had a feeling himself that the people of Birkenhead, relieved of the necessity of providing a new independent supply at a cost of at least £750,000, might have been well content to bear the existing water debt; and the members of the Committee knew that he pressed hard and long for the elimination of this condition. Birkenhead pointed out that Liverpool were acquiring all the property of their water undertaking, which had cost the borough more than £265,000, and which had regularly been renewed and maintained out of revenue; that they were absorbing the profit of over 1d. in the pound on the rates, which had been derived from working the Birkenhead water undertaking; that even after relieving them of the £50,000, they would have a water debt of £136,000, on which interest and sinking fund would have to be paid for about forty years; and that this interest and sinking fund, together with the amount added to the general rate by the loss of profit hitherto made on their water undertaking, would amount to nearly 4½d. in the pound on their rates. This they would have to pay in addition to the payment of Liverpool's water charges; and Liverpool would undoubtedly have a surplus on the Birkenhead account (even after adopting this liability), variously estimated at £10,000, £12,000, and £15,000. It was quite clear that the estimate of a £10,000 surplus from Birkenhead was a very moderate one—indeed, the Borough Treasurer of Birkenhead was of opinion the surplus revenue would be not less than £15,000. It was easy to talk of obtaining better terms; but the Water Committee had done their best to make a good arrangement for Liverpool.

The resolution having been formally seconded, the opposition was opened by Sir Charles Petrie, who remarked that the sole question for the Council to consider was whether the proposed agreement with Birkenhead was going to be both in the present and in the future good for the people within the existing water supply area of Liverpool. If Liverpool had any water to spare, why not offer it at a low price to manufacturers, and thus induce large works to be set up in the city, giving employment to the ratepayers and Liverpool people generally? Hitherto the charges had been quite prohibitive. In his opinion, the present Council had no right to commit their successors to such great responsibilities, the limit of which could not now be estimated, for a small and doubtful pecuniary benefit; and they would be taking a foolish step in admitting another powerful Corporation into partnership, and possibly laying the foundation for an agitation on the part of the junior partners at some future date to wrest the control of the waterworks from the Corporation.

An amendment was then moved by Mr. B. W. Eills, and seconded by Alderman Salvidge, to the effect that a permanent supply should be refused, but that Birkenhead should be offered a temporary supply in bulk, for a limited period, on terms and conditions somewhat similar to those given to Wallasey. Sir W. B. Forwood also asked the Council to pause before parting with the valuable heritage they possessed. Having regard to the requirements of their own growing population, they ought not to enter into such an engagement of a permanent character. Not only had they to supply Bootle; but they had liabilities to Wigan, Widnes, Warrington, and other places which might be called upon any day. He saw plainly that when, whether in twenty or fifty years, they approached the end of their resources, Liverpool would be placed in a very serious position to obtain another adequate supply for the future. For these reasons, he asked the Council to seriously pause before committing themselves to any agreement of a permanent character. Let Liverpool supply Birkenhead with water until it was able to supply itself; but beyond that they should encourage the manufacturers of the city. Liverpool was too largely dependent upon its shipping; and manufacturers should be encouraged. They could not hold out any hope of a great reduction in rates; but by giving cheap water, they could perhaps persuade manufacturers to settle among them. At the present time, they were charging 2s. 6d. per 1000 gallons to shipping. If they had surplus water, let them improve upon this charge. Sir Thomas Royden spoke in the same strain; but Alderman Oulton thought it would be better for them in Liverpool if Birkenhead was not a competitor when the time came that Liverpool would have to seek for a larger supply, but that she should be a partner.

Several other members spoke for and against the proposal; and then Mr. W. W. Rutherford, M.P., said that, after all the agitation there had been about this matter, the whole Council and the city were under a debt of gratitude to the Water Committee and to their able Chairman for bringing forward the question in such a lucid and understandable form. One speaker had said that there was no limit to ingenuity; but he would point out that there was a limit to water. The requirements of Birkenhead were about 4 million gallons a day. Now it was perfectly idle to tell the Council that if they had got another supply of 4 million gallons to deal with, it would not accelerate the time when another pipe line would be required. But this subject, he contended, was not a question of one, two, or three pipe lines, or a question even of a small amount of rate, and certainly not a question of profit to the city; because supposing the wildest dreams of those who had put forward this scheme were realized, it would not mean £10,000 in relief of the Liverpool rates. All it would amount to would be that they would perhaps be able to lay a triflingly smaller rate for the city. Any advantage of this kind must be looked at in conjunction with the risks that they would run. There were thousands of acres of land between Vyrnwy and Liverpool and between Rivington and Liverpool, in regard to which Liverpool was under a parliamentary obligation to supply them when they might be called upon to do so on certain conditions. These parliamentary obligations, which they could not escape, ought to be taken into consideration; but they were told frankly that they had not been taken into consideration. It was not a question therefore of figures or of little profit. It was really this—that those men who had preceded them in managing the affairs of the city had had the foresight and enterprise to provide the city for many years to come with a supply of the finest water. They had no right, by any vote in the Council, to run the slightest risk of impairing their present supply, which placed them in such a splendid position among the municipalities of the country.

Alderman Burgess, in replying on the discussion, said the only way to reduce the price of water to manufacturers was by getting revenue from some other source or by raising the charge for domestic supply. He agreed that it was absolute folly, even insanity, to risk the water supply of Liverpool itself. If he were not in absolute confidence that the proposal could be carried into effect without in any way risking the water supply of Liverpool, he would not be a party to it. The area of the supply in Birkenhead could only be extended to a small degree; and when Liverpool could not spare 4 million gallons, it would be time to get another pipe-line. If they got within 4 to 10 million gallons of their resources, it would be necessary to secure an independent supply somewhere else. It was for the Council to say whether they would allow Birkenhead to come in when she was willing; but the Water Committee would not have done their duty if they had not brought the proposal before them in some shape.

A vote was then taken, when the amendment instructing the Water Committee to offer Birkenhead a temporary supply, but not a permanent one, was adopted by 84 votes to 15.

Reports by the Water Engineer and City Treasurer.

In the course of the debate, numerous references were made to reports on the subject before the members, which had been prepared by the Liverpool Water Engineer (Mr. J. Parry) and the City Treasurer and Controller (Mr. R. Barrow). The first dealt with the question of how the proposed supply to Birkenhead would affect the present water reserve, and the second with the financial aspect of the agreement.

Mr. Parry says there is in reserve a quantity of water amounting to at least between 12 and 13 million gallons per day, available for meeting the domestic and trade requirements of the future, and for possible demands under the Wallasey and other agreements. With regard to the requirements of the future, from a general review of the position, and taking into account the growth of demands on the undertaking as indicated by the experience of the past, he is of opinion that the increase of consumption is not likely to exceed 500,000 gallons per day per annum, if reasonable care is taken to prevent excessive waste and

misuse. In order to furnish information of a more specific character, he has prepared a statement showing the future growth of population in Liverpool and the surrounding compulsory area of supply, on the assumption that the population will continue to increase at the same rate as shown by the two last decennial census returns. The calculation has been made in two ways—first, by taking the total population of the city and out-townships in one figure, and, secondly, by taking the population of the city and out-townships separately. The first method gives a total population in the year 1931 of 1,156,304; and the second gives a total of 1,175,741 in the same year. Adopting the higher of these two, and assuming an average consumption of 30 gallons per head per day, the average quantity of water required for the supply of Liverpool and the surrounding district in 1931 will be 35,272,230 gallons per day. This quantity does not include supplies in bulk given to local authorities and others under existing agreements. These supplies amounted last year to an average of 2,147,000 gallons per day, and may possibly increase in the future to about 4,500,000 gallons per day. Nor does it include the supply to the town of Chorley. If all these are added together, the total average demand for water in the year 1931 will be about 40,632,230 gallons. The total quantity actually supplied last year was 29,740,000 gallons per day. It follows that the total quantity required to meet the probable demands under existing obligations twenty-five years hence will be an average per day of 10,892,230 gallons in excess of the requirements of last year. Under these conditions, there will still be left in 1931 a balance of about 1,600,000 gallons per day of the reserve quantity of between 12,000,000 and 13,000,000 gallons per day—say, 12,500,000 gallons—quoted above. With regard to the effect of supplying Birkenhead, the estimated consumption of the town in the year 1931 is 6,114,925 gallons per day; and the first question to be considered is how much of this can be obtained from the sandstone wells which now furnish the whole of the supply. Assuming one-third to be obtained from the wells, the volume of Vyrnwy water required will be 4,000,000 gallons per day. Adding this to the 10,892,230 gallons given above, brings the total up to 14,892,236 gallons per day, which shows a deficiency of 2,392,230 gallons per day in the year 1931 on the estimated reserve of 12,500,000 gallons per day, and a deficiency of 1,892,230 gallons per day on the higher estimate of 13,000,000 gallons per day. This would exhaust the present reserve about the year 1926; and it would be necessary to commence the laying of the third pipe-line from Lake Vyrnwy before that year. These inferences depend not only upon the accuracy of the forecast on which they are based as to the future requirements of Liverpool and Birkenhead, but also on the more doubtful estimate of the requirements of the districts supplied in bulk. If these should be less than assumed, the duration of the reserves will be correspondingly lengthened.

Mr. Barrow, in the course of his report, deals with the immediate financial result of the proposal, and says it is estimated that if Birkenhead was included in the area of supply next year, the income from that area for the year would be approximately £32,500. The expenditure charged to the revenue account of the Birkenhead water undertaking, together with the sums charged to the renewals fund during the two years ended March 31 last, amounted to £44,136, or an average of (say) £22,000 per annum, of which £9660 represents the amount charged to maintenance of pumping-stations. He is not in a position to estimate the prospective expenditure on the Birkenhead water undertaking if the proposed agreement is carried into effect; but for the purpose of his report, it is assumed that the expenses are as here stated, and will not be subject to alteration, though, as the Water Committee point out in their report, "in view of the fact that it is proposed to provide immediately a considerable quantity of the water to be supplied to Birkenhead from the Wallasey main, the cost of pumping should be substantially reduced." Clause 5 of the heads of agreement provides that "on the Liverpool water supply area being extended to the Birkenhead district, the Liverpool Corporation shall either pay to the Birkenhead Corporation the sum of £50,000 towards the payment off of the Birkenhead water debt, or shall take over the liability for the discharge of the same amount of debt." If it is proposed to pay annually to the Birkenhead Corporation a sum representing a proportion of their annual charges for interest and sinking fund, the charge would be, for forty-five years, about £2000 per annum. If it is proposed to hand over £50,000 in cash, and statutory authority is necessary to empower the Corporation to do this, the period fixed for repayment would determine the amount of the annual charge for repayment of the debt. If it is assumed that a period of forty-five years is allowed for repayment, and the sinking fund is calculated on the 3 per cent. table, with interest at the rate of 3½ per cent. per annum, the annual charge for interest and sinking fund would be £2289. If thirty years were allowed for repayment, then, on the same bases, the annual charge would be £2801. After due consideration of the foregoing figures, it will be seen that if the cost of pumping can be reduced by £2000 per annum by reason of the supply from the Wallasey main, the Water Committee are justified in anticipating that the receipts from the Birkenhead area of supply will probably exceed the portion of the expenditure which can be distinctly allocated to that area by about £10,000; but allowance would have to be made for such increased revenue when preparing the estimates, and Birkenhead would participate with the rest of the water area in any reduction in charges rendered possible by reason of such additional income. The above figures deal only with the assumed experience of the first year, and do not represent the financial position when it has become necessary to lay a new main for the supply of Birkenhead. In the event of the Corporation being required to lay a main from Hatchmere at a cost of (say) £100,000, the charge for interest and sinking fund, assuming that thirty years is allowed for the repayment of the capital, will be about £5600 per annum. If a period of sixty years is allowed for repayment, the annual charge will be £4113. In addition to this annual charge, there will be the costs incidental to the maintenance of the main and accessories, rates, &c. But, on the other hand, it is reasonable to suppose that there would be a reduction in the cost of pumping, which amounts at present to £9660 per annum on the average of the past two years. Then the question of the acceleration of the date at which it will become necessary to lay the third pipe-line from the Vyrnwy works has an important bearing upon the financial result of the proposed agreement. Clause 6 of the heads of agreement provides that, on the payment over to the Corporation of Birkenhead of the said sum of £50,000, or on the assumption of the liability for this amount by the Corporation of Liverpool, the Corporation of Birkenhead shall hand over to the Corporation of Liverpool the land, buildings, wells, and other property of the Birkenhead Corporation water undertaking specified in the schedule, and shall transfer to the Liverpool Corporation the sum of £5861 19s. 11d. standing to the credit of the Birkenhead Corporation renewals fund account, or such sum as may at the date on which the said wells, reservoirs, and other property are transferred to the Liverpool Corporation be standing to the credit of the said account.

Birkenhead's Decision.

The Gas and Water Committee of the Birkenhead Corporation met on Friday to consider this development of the situation; and they unanimously decided to proceed with the gravitation scheme proposed by Mr. G. F. Deacon, for obtaining a water supply from the River Alwen. Particulars regarding this scheme were given in the "JOURNAL" for June 12 (p. 726), though the exact source from which the water was to be derived was not at that time generally known.

WATER-WORKS PURCHASE QUESTION AT PORTSMOUTH.

Scheme Rejected by the Council.

A Meeting of the Portsmouth Town Council was held last Tuesday, at which the Water Committee submitted the agreement for the sale and purchase of the Water Company's undertaking, and recommended that the common seal should be affixed to it, and the necessary steps be taken for promoting a Bill to carry out the agreement. They added that they had very carefully considered the question of purchase, and were of opinion that the undertaking should be acquired. At the same time, they believed the terms arranged were the best which could be obtained.

In moving a resolution in accordance with the Committee's recommendations, Mr. Pink went at length into the history of the question. He said that the latter part of last year there were one or two heavy storms; and it was found that dirty and discoloured water was being supplied. The Council were anxious to know what was to be done to make the water clearer and better; but the Directors refused to do anything, and further said that the matter of filtration was one of sentiment. The Council accepted the explanation, and waited. The Company meanwhile were promoting a Bill, which the Council decided to oppose; and when the subject of purchase was mentioned, the Council unanimously requested the Committee to see what they could do. It was felt that the water was not good enough, that there was not sufficient supervision, and that the safety and health of the borough would be better served if the Corporation took over the control of the undertaking. There was no need to fear any falling off in the supply of water for many years to come. There was ample. He believed the Company had still one spring untouched, which would yield a very large supply. Then as to filtration, he thought the cost of this would be about £60,000. He did not, however, propose to go deeply into figures. All they had to consider was the extra cost to the Council, and whether there was ample revenue to pay for all the outgoings. So long as the revenue was sufficient for this, the Council need not go into figures that day. The only question was as to the sinking fund, and what it would amount to. The fact that the capital account had increased since the commencement of negotiations need not trouble them, because there had been an increase in the area, and consequently in the profits. The figures supplied by Mr. Bone, the Borough Accountant, showed that if the money could be borrowed for a hundred years, the sinking fund would be £1234 per annum; if for eighty years, it would be £2550; and if for sixty years, it would be £4441 per annum. If they went through the balance-sheets of the Water Company, they would find that for the past three years there had been a large surplus, over and above all sums required to pay liabilities, of between £3000 and £4000. The last twelve months, however, did not show this surplus, owing to the fact that the sums which ought to be charged to capital were charged to revenue. In calculating the sinking fund, the Council would have to take into consideration the surplus which the Company showed; and in addition to this there would be the saving they could effect in connection with the Directors' fees, which would come to £700 or £800 per annum. They had practically £3800 or £4000 to supply them with the required sinking fund. Beyond the sinking fund, they would have to pay the cost of filtration; and this they could not estimate at less than £3000 per annum. On the hundred years basis, at the worst, the loss would be £430 per annum, on the eighty years basis £1750, and on the sixty years basis £4640. Against this, there was the probability that the Council would be able to effect a certain amount of saving. As the collection of the water-rentals would very likely be transferred to the rate-collecting department, certain officials of the Water Company would in time drop out, and would not be replaced. He believed that very great economy could take place in some of the working. The Company was a flourishing concern, and earned more than was sufficient to pay the dividends. If the Corporation decided to purchase, they must be prepared to pay the full price to the shareholders, and could not expect to get a penny piece abated. He had not the slightest fear, provided they could get a hundred, or even eighty, years, that there would be any charge upon the rates at all. There was the natural increase of the profits of the Water Company to set against any small loss which the Corporation might incur the first year or two after the transfer. With careful management, he thought they would be able to take over the Company, and insure the purity of the water without loss. As a Council, they should look after the water supply of the town. If they did not buy now, they would lose their chance for ever. Unless they seized the opportunity to-day, and determined to look after the water supply, they would make a great mistake; and future generations would call down anything but blessings on their head. He asked them to pass the agreement.

The resolution having been seconded, Mr. Corbin moved, as an amendment, that the matter should be referred back. He said that, though he was strongly in favour of the undertaking being in the hands of the Corporation, it was his intention to strongly oppose the purchase until fairer and more equitable terms could be obtained from the Company. They could not afford to ignore the evidence of Mr. Ashley, who had pointed out the absolute necessity of immediately enlarging the works and extending the area of supply, at an estimated cost of something like £300,000. Yet in cross-examination Mr. Ashley stated that in all probability, if the water was taken from the extended area, it would interfere with the Company's present sources. Mr. Quick also agreed with Mr. Ashley. Then they must not overlook the fact that the Railway Companies were laying claim to a certain spring which yielded a million gallons daily; the Gas Company had a well, and so had a brewer; and the Tramway Committee were likewise thinking of sinking their own well. These alterations would seriously affect the revenue of the Water Company. But another point of far greater importance was that the Local Government Board would not sanction the borrowing of money for more than fifty years, whereas the figures brought before them in favour of the purchase had been based on an eighty years' repayment. It would be a sorry day for Portsmouth if the resolution was carried. It would be bad finance as well, because he believed they could obtain the undertaking on more equitable terms by promoting a Bill in Parliament.

Mr. Brewis seconded the amendment; and then there followed a series of speeches against the proposal to purchase. Mr. Forster thought they would be making a bad bargain; and Mr. Stobie, who originally supported the scheme, now opposed it "because things had come to light of which the Council had previously no idea." Not only were there the wells, but there was also Mr. Ashley's evidence; while the condition of the mains was unknown. Mr. Murtough, however, said that the Committee had got down to "bed rock" in the matter of price; and the undertaking should be purchased, so that the town might be responsible for the purity of the water supply. This, thought Mr. Gillett, could be just as well looked after by the Directors; and his advice therefore was to leave the matter where it was at present. Mr. Evans agreed that the undertaking should be in the hands of the Corporation; but at the same time he said they could pay too much for a thing. The period had gone by when the Company could shirk their responsibilities; and it was impossible for them to put off filtration much longer. After some further speeches, the amendment was withdrawn, so that the Council might have a "straight vote."

Then Mr. Pink replied to the discussion; observing, with some feeling, that he wished a few of the members had had the courage to speak as they had some months ago, when the matter was first brought up. If they had done so, it would have saved an enormous amount of time and trouble. The Water Committee had worked very hard; and if anything of this sort came up in the future, he hoped that the members would have the courage to properly discuss the matter at the right time. Mr. Corbin had referred to the extended area. The Government, he was convinced, would not permit a foreign water company to interfere with the supply of the town. As regarded companies sinking wells in the town, it would not be all loss, as a certain saving would be effected on the cost of pumping. The supply was ample, as there were several springs which were at present unused. It was a question whether they should have command of the supply of water or not. It was less than a year ago that the Council were unanimous in their condemnation of the Company; yet to-day they heard that the Council had every confidence in them. ("No, no.") The Company had refused to filter the water; and it would be to the interest of the town for the Council to have the control of the supply in their hands, so that they could guarantee its efficiency and purity.

A division was then taken, when the resolution was lost by 8 votes to 34.

SOUTHPORT WATER BOARD ACCOUNTS.

Elective Auditor's Criticism.

In the course of a lengthy report to the Finance Committee of the Southport Corporation, Mr. S. Hardman, one of the Elective Auditors, makes some trenchant criticisms of the Water Board accounts. The Board is composed of representatives of the Southport Corporation, the Birkdale Urban District Council, and the West Lancashire Rural District Council.

Mr. Hardman says: "The precept for the Water Board was presented to me; and I observed that there was a serious deficiency in net revenue of £6358. On making inquiries, I found also that water charges had been increased considerably as compared with the charges of the old Water-Works Company; the rates having been raised to the maximum. I called for the production of the books, but was informed that the Elective Auditor was not entitled to see the Water Board accounts after the precept was presented to him. Having regard to the serious deficiency, I considered it was my duty to the ratepayers, before presenting my report or signing the accounts, to investigate the loss on the working; and I attended the Local Government Board audit and inspected the accounts. I found that the cost of the Water Board Bill of 1905 was no less than £8076, inclusive of a fee paid to Messrs. Rofe and Son, of Westminster (for preparing a report and scheme), of £2000, in addition to a retainer of £200 a year."

Mr. Hardman refers to a letter, which had appeared in the local Press, stating that a sum of £12,607 had been paid as compensation to officials on the taking over of the undertaking, "presumably for loss of office;" and he mentions that he found that, with a few exceptions, the Board retained the services of the officials so compensated. He had submitted this letter to Counsel (Dr. Hugh Fraser), and his opinion was: "By section 23 of the Southport Water (Transfer) Act, the Water Board shall pay compensation to any officers and servants in the regular employment of the Company . . . who shall not be retained by the Board in the same or similar office or employment . . .

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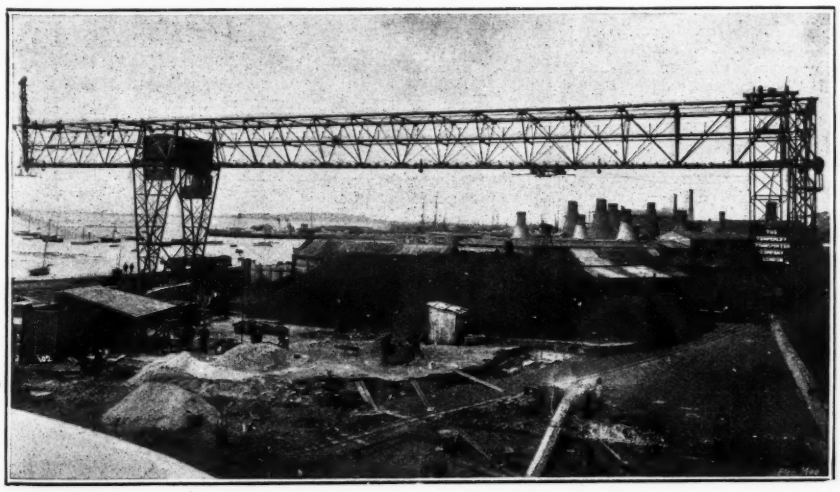

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in respect of any loss of office by reason of the transfer of the undertaking of the Corporation to the Board; and no such officer or servant who shall have been in the service of the Company for ten years previously to June 28, 1901, shall lose his right to compensation by reason of his declining to enter into, or continue in, the service of the Board and claim compensation pursuant to section 23 of the Act." Mr. Hardman expresses the opinion that though this unusual waste of public money (compensating officials for loss of office and re-engaging them) might be legally justified, it was morally wrong and shameful.

The conclusion come to by Mr. Hardman, after investigation, is that the deficiency on working has arisen mainly from the excessive price paid for the undertaking to the old Water Company, and that the precept will be largely increased from March, 1907, when the sinking fund comes into operation.

A NICE POINT IN LOCAL AUTHORITY LAW.

Writing in the "Municipal Journal" last week, a Barrister deals with a question put to our contemporary by "L. C." in regard to the sale of coke from a Corporation Gas-Works to a member of the Corporation. A similar case to that referred to was reported upon by our Edinburgh correspondent in last week's "JOURNAL," and is further dealt with to-day.

"L. C." put this question: The local authority for which I act undertakes the supply of gas within its district. The coke manufactured is sold on the works to any applicant applying for same and producing the necessary cash. Is it competent for a member of the local authority to purchase coke in the manner described, or would he, by reason of such purchase, be considered to be interested in a contract with the local authority, and so render himself liable to the prescribed penalties? Purchasers of the coke frequently engage a local coal dealer, who is also a member of the local authority, to cart the coke for them from the works. Can it be said that by reason of such carting he is interested in a contract with the authority?

The Barrister replied that he felt some hesitation in advising in this matter. The wording of section 46 (1) (*e*) of the Local Government Act, 1894, is explicit and far-reaching. As to small purchases, for ready money, made by a member of a local authority in the same manner as purchases by any other member of the general public, he would feel disposed personally to rely on the good old legal maxim, "*De minimis non curat lex*." But, as he said, he felt some hesitation. In a comparatively recent case a chemist was held to be disqualified to serve as a member of a municipal corporation because, *inter alia*, it was proved that he had supplied four pennyworth of oil to a member of the fire brigade on behalf of the corporation. (*Nell v. Longbottom*, 2 Q.B., 767, 70 L.T., 499.) It would seem from this that the Courts are inclined to apply the provisions of the section very strictly indeed; and on the whole it might be that the safest course for a member of a local authority was to be what Cæsar's wife was not—viz., above suspicion. The mere carting of coke bought at the gas-works does not seem to the writer to be "an interest in a bargain or contract" with the authority. He had not come across a legal decision exactly in point, but should say that, if the question were raised, a Court of Law would rule that the interest, if any, was too remote to disqualify.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

When I wrote last week of the Paisley gas coke incident that "it would have effects reaching farther than the Council Board in Paisley," I did not anticipate so speedy a fulfilment of my expectations. Yet, even already, the little flame kindled in Paisley has penetrated the Corporation of Glasgow, where even the unseating of the Lord Provost himself is spoken of as within the bounds of possibility.

Perhaps it would be better to treat the matter in its sequence. Last week I gave the opinion of the Lord Advocate upon the subject, and stated that, in consequence of this opinion, Bailie Caldwell tendered his resignation as a Town Councillor of Paisley. On Monday, the Council met to consider the position of Bailie Dougall, the other Magistrate implicated. Bailie Dougall did not look upon the matter in the same way as Bailie Caldwell. He said that since their last meeting he had given the question his most serious consideration, especially in view of the step taken by his colleague, Bailie Caldwell. The matter seemed to him to be a far-reaching one, looking at the statement in the opinion of the Lord Advocate, to the effect that were the cases those of private consumers purchasing goods in ordinary open market there would still be a serious question to be determined. The coke purchased by him was of very small quantity, amounting to only three cartloads during the present year; and he accordingly regretted that he could not see his way clear to take the step which Bailie Caldwell had taken. Were he to do, so he should feel that he was taking guilt where there was none, and possibly doing the ratepayers whom he represented, and himself, an injustice, especially as what he did do was done after inquiries made as to the legality thereof; and as he might have handed over the purchasers to the Gas Manager direct, as suggested by the Lord Advocate. Possibly he might be allowed to state that the purchasers paid no more, and the Gas Corporation received no less, than if the purchases had been direct. However, he was anxious not to have any conflict with his colleagues, or to cause trouble; and should the meeting decide that the whole circumstances warranted his retiral, he was quite prepared to abide by their decision. Bailie Dougall then left the meeting, stating that he thought it better not to be present at the discussion, so that his presence might not in any way interfere with their impartial consideration of the question before them. Provost Eadie said that he, too, had given the matter very serious consideration, and he had no hesitation in submitting a motion in his own name. He moved that, being persuaded that the interests of the town had in no way suffered, and that such purchases on the

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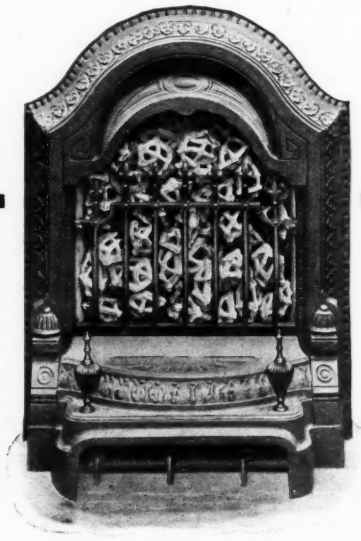

part of Bailie Dougall had ceased, they take no further action in the matter. Mr. R. D. Brown (at whose instigation the matter was originally raised) said he was surprised at the motion, after the clear and emphatic statements made by the Lord Advocate. If the motion were carried, it would probably lead to something further than having to be considered by the members. It was as clear as day, from the opinion they had got, that the gentlemen referred to had acted wrongly in the purchase of the coke. He moved that the Council adhere to their former resolution to be guided by the Lord Advocate's decision, and act accordingly. Provost Eadie said the Lord Advocate had held that the purchases of coke were illegal, but this did not necessarily apply to the vacating of seats in the Council. His impression was that they were to be guided by the Lord Advocate's opinion only as to the legality of the purchases. They had adopted the advice, and the purchases had stopped; but it had to be remembered that anything which had been done had been done in good faith. Bailie Baird, after a few remarks, moved that the seat of Bailie Dougall be declared vacant. Mr. Brown accepted this amendment in lieu of his own. Mr. Stewart expressed his regret that he was unable to accept the Provost's motion; and he instanced the case of a gentleman in Dumbarton who had resigned in view of the Lord Advocate's opinion in the Paisley case. That gentleman, he held, had acted in an upright manner; for, though his colleagues had asked him to stay till November, he had refused, as an honourable man. Mr. Brown mentioned that it was his intention, were the motion carried, to apply to the Secretary for Scotland, with the view of obtaining his opinion upon the subject. On a division, the amendment was carried by nine votes to eight, and the seat was declared vacant. Mr. M'Nair afterwards asked whether the Lord Advocate's opinion applied to the case of a public official drawing a salary from the Corporation and at the same time supplying goods to that body. The Town Clerk replied that, so far as he could make out, he did not see that the Lord Advocate's opinion applied to such a case. It was confined to members of the Corporation, and did not apply to officials. The Town Clerk, however, expressed his willingness to look into the matter, and the subject dropped.

This brings me to the case of Glasgow, the Town Council of which met on Thursday, with Lord Provost Bilsland in the chair. The meeting was a stormy one, on account of Mr. Scott Gibson putting a series of questions, the avowed object of which was to obtain inquiries into various fancied irregularities. Among them was a multiform question to the Town Clerk, asking whether his attention had been directed to the opinion of the most eminent legal authority in this country—the Lord Advocate—with regard to the illegality of certain members of Scottish Town Councils who had been guilty of trading with the Corporations, in the way of purchasing coke; if his attention had been directed to the case of Paisley, where a Magistrate had had to resign; and if it were the case that the Lord Provost of Glasgow, and certain other members, had been guilty of a similar offence; and if that were so, would he impress upon those gentlemen the necessity of tendering their resignations, and thus bringing themselves into line with the Lord Advocate's opinion. The Town Clerk replied that he had seen and considered the opinion of the Lord Advocate, overturning what had previously been a general understanding, limiting the definition of a certain qualifying word in the Town Council's Act of 1900. It coincided with his information that this opinion was strictly confined to certain specific cases submitted to the Lord Advocate. He was quite sure that at the present moment no disqualification attached to the Lord Provost; and he was pretty sure that, so far as his knowledge—certainly his official knowledge—went, no disqualification attached to any member of the Corporation of Glasgow. If disqualification did attach to any of them, he should consider it his duty to bring the matter under their notice, in order that such disqualification should cease as soon as possible. The Lord Provost said that as his name had been mentioned in connection with this matter, and as the opinion of the Lord Advocate in the Paisley case had occupied the public mind, he had felt it to be his duty to take the best legal advice he could find in Glasgow; and on submitting all the circumstances, he had been assured that he was in no sense disqualified, and that he would not be disqualified by any Court in the kingdom. There the matter ended in the Council. Whether more might be heard of it from the same quarter we cannot tell, not being aware of the full extent of Mr. Scott Gibson's capabilities; but next day we had the opinion of the Editor of the "Glasgow Herald" upon the matter, in a leading article, to the effect that "with whatever motive the subject of the purchase of coke by the Lord Provost from the Corporation was raised, now that it has been raised it should be threshed out, and Mr. Bilsland should lose no time in procuring legal opinion of greater authority than any that can be obtained in Glasgow." Further on, he says that "a Supreme Court decision must be got some time on the application of the Act of 1900 to such cases." This is a throwing down of the gauntlet in a way which the Lord Provost can hardly avoid the taking up of it. The Lord Provost of Glasgow, it may be mentioned, is a baker on an extensive scale, and uses coke in large quantities. His case is very different from that of the Magistrates in Paisley, in respect that he purchases the coke for his own use, and not for re-sale; and it will be remembered that it was the middlemen whom the Lord Advocate's opinion struck at, not the private consumer, although he did not close the door against consideration of the case of the private consumer. If the Lord Provost is prepared to ignore the opinion of the Editor of the "Glasgow Herald," there may be no further trouble in this matter. If he is not, then he will be under the necessity of raising an action in the Court of Session, probably to have it declared that he is not disqualified. Even as to that there would be difficulty, because he holds a legal opinion in his favour, which is sufficient to cover him, and he is under no obligation to impugn it. It lies with those who object to his position to seek declaration that he is disqualified. The Lord Provost of Glasgow may escape being called to book; but if, in a process relating to another Corporation, it should be found that the practice was wrong, he would then be brought into the mesh, and whatever administrative acts he may have done during his term of office would be in danger of being called in question. It is this which makes the subject of so much interest. It is a question of great importance in municipal affairs. If it should result that members of corporations are debarred from trading with the corporations of which they are

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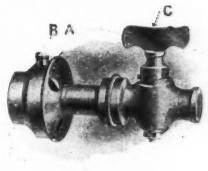

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members, the effect would be to remove out of public life some of the best men now in it. This is a consequence which is not to be lightly contemplated. But in view of the fact that there are some who hold the extreme view, and of the further fact that there are gentlemen in almost every corporation who would be found in a similar position, and of the after-troubles which might ensue, it would, on all grounds, be to the advantage of everyone to have this bogey laid, by appealing to the Law Courts for their interpretation of the Act of Parliament.

The gas-mantle dispute was before the Perth Town Council on Thursday. The Council, in committee, agreed that in view of the arrangement between the Gas Department and the Lighting Department, of Feb. 1 last, the Council take no further action in the matter. In open Council, Mr. Macpherson moved that this be adopted; and the motion was agreed to unanimously. Lord Provost Cuthbert explained that an imputation had been cast upon the Gas Department, which meant that the Gas Manager and himself, as Convener, had been the means of making a firm change a quotation for the supply of mantles. He denied this emphatically to the Committee, but they did not believe him; and he felt it to be his proper course to retire. There seemed to be a feeling now that Bailie Young and he had taken the wrong view of the matter, and that they should withdraw their resignations. He would not say whether he would or would not. Bailie Young said that, seeing it was so near November, he would continue to act as Convener; but at that time he would consider his position. Bailie Mackay said he would move at the next monthly meeting that the minute of Feb. 1 be rescinded, in order to give outsiders an opportunity of supplying mantles. Bailie Alexander, who brought the matter forward, disclaimed that he had any intention of laying anything to the charge of the Lord Provost or Gas Manager.

At the last meeting of the Arbroath Town Council, Bailie Thomson, the Convener of the Finance Committee, in introducing the gas accounts for the year to May 15 last, said that the amount received for gas sold was £11,515, which was somewhat less than in the preceding year, owing to the reduction in the price of gas, although the consumption had been greater. They received for residual products £2586. The total receipts were £14,174. The working expenses amounted in all to £10,032; leaving a balance of £4142, to which had to be added cash in hand to the amount of £301. They had paid £1352 of annuities, £702 of interest, had carried £575 to the sinking fund, and £925 to the contingency and depreciation fund, and had paid the statutory contribution of £250 to the harbour fund—in all £3803; leaving a balance in hand of £639. When they considered that the price of gas was reduced last year by 2½d., making it 2s. 11d. per 1000 cubic feet, the account showed really excellent results. They had reduced a £7 annuity at a cost of £208 out of the sinking fund; leaving a balance in the fund of £1016. They had applied £949 of the contingency and depreciation fund in writing off the prices of exhausters, tar-extractor, and new tar-pump; leaving a small balance of £3 3s. at the credit of the fund. Thus they would all see that the whole of the gas accounts were in an exceedingly favourable condition. The accounts were adopted. In the report of the Gas Committee, it was stated that the Assessor for the burgh had intimated that he had fixed the valuation of the gas undertaking for the year at £3500—an increase of £330 over the valuation of last year. The valuation having been increased in the previous year by £600, and no additions having been made to the capital value of the works during the past year, the Committee did not see that there was any sufficient ground for the valuation being further increased, and they instructed that the Assessor's proposed valuation be appealed against. At a subsequent meeting of the Committee, it was reported that the Assessor had agreed to reduce his proposed valuation by £150, and the Committee had acquiesced. Mr. G. Anderson, in moving approval of the minutes, said that the utmost economy was shown in buying and selling. He did not think that coal would get cheaper. If the Committee could have seen their way to reduce the price of gas, they would have done so. The minutes were adopted.

The question of the valuation of the gas-works has also been before the Denny Town Council. It was reported that an appeal had been intimated against the valuation, on the grounds that the allowance for working capital was insufficient, and that the valuation should be based on the receipts and expenditure of an average of years, and not of one year only as hitherto. The Assessor agreed to comply with the views of the Council, and to fix the valuation at £468, instead of £795 as proposed. The Council considered the reduction satisfactory.

Public Lighting at Ramsbottom.

The annual report of the Ramsbottom Lighting Inspector states that the Urban District Council have at present 482 lamps throughout the district. The total number on the incandescent system is 280; the whole of the main roads being lit in this way. The consumption of gas by the street-lamps last year was 3,098,196 cubic feet; the cost being £494 10s. 6d. The wages paid during the season amounted to £264 14s. 9d.; so that the cost of gas supply and lighting was £774 5s. 3d. The average consumption per lamp at Summerseat was 5105 cubic feet, and the cost £1 16s. 11d.; the average at Ramsbottom was 6727 cubic feet, and the cost (including wages) £1 11s. 5·18d. The lamps were lit 1769 hours last season, against 1716 hours the previous year. The average consumption of gas per lamp on the incandescent system was 6801 cubic feet, and 6496 cubic feet in the ordinary lamps. The bye-passes were removed from the incandescent burners previous to the commencement of the lighting season last year; it being thought a great saving might be effected by so doing. The consumption per hour on the incandescent lamps during the season 1904-5 was 4·48 cubic feet; while at the end of the season 1905-6, it was only 3 84 feet. Thus the saving was 0·64 cubic foot per lamp per hour. This represented 281,200 cubic feet of gas, which at 3s. per 1000 feet costs £42 3s. 8d. During the summer several lamps at Riverside, Summerseat, were changed to the incandescent system, and were lit all the summer months.

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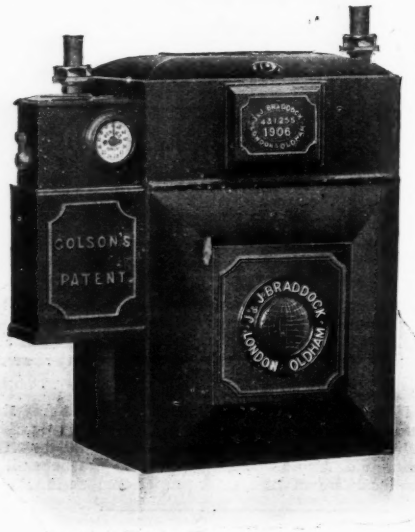

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CURRENT SALES OF GAS PRODUCTS.

Week ending Sept. 22.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 22.

Demand has been well sustained, and all parcels offered have found a ready market. Prices, however, remain as last quoted—viz., £11 17s. 6d. per ton f.o.b. Hull, and £12 to £12 1s. 3d. per ton f.o.b. Liverpool and Leith. There has also been good inquiry for October-December. In this position £12 5s. per ton is quoted, but buyers for the most part refuse to operate at the price. Further business is reported at £12 10s. per ton for delivery over the spring months; and this is the closing quotation.

Nitrate of Soda.

This article is very firmly held, and spot prices remain 11s. 7½d. and 12s. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *Sept.* 22.

There has not been much alteration in prices during the past week, but they have been steady all round, and with an upward tendency. The firm tone in the market for pitch still continues in spite of there being very little inquiry from the Continent. London manufacturers report having done business at both 31s. 6d. and 32s., and now ask 32s. 6d. On the east coast, values may be taken as from 31s. to 32s.; and business is reported to have been done at 31s. 6d. for delivery to the end of the year. On the west coast, 30s. is said to have been paid in Manchester for delivery to the end of the year, and manufacturers now ask 30s. 6d. to 31s.; while 31s. 6d. is reported to have been paid in Liverpool. There has been a fair amount of business doing in South Wales for delivery over the first six months of next year at fairly good prices; but the consumers in this district appear to be well bought for this year's delivery. Creosote still remains very firm. London manufacturers have hardly any stocks, and are asking high prices for the small quantities which they may have for disposal. They evidently anticipate a very good demand for next year's delivery, and are not at all anxious to do business. In the Midlands, manufacturers ask 1⅞d. to 1¾d.; while in the North a large business has been done at 1⅞d. at makers' works. But most of the manufacturers are well sold, and require 1¾d. for any small quantity which they may have left for delivery. There is no change in carbolic acid. Continental consumers are still willing to pay 1s. 9d. for small quantities for delivery during this and next month, but do not care to buy further forward. English consumers appear inclined to do business to the end of the year on a basis of about 1s. 8½d. *ex* works; but for delivery next year, they will not offer more than 1s. 8d. There is very little demand indeed for crystals; and it is reported that the French Government contract was taken at under 5¾d. for 39-40 per cent. Salts continue in good demand; and manufacturers do not care to sell unless they can realize a good price. Benzol is very firm indeed. London manufacturers are well sold, and are asking 10½d. to 10¾d. for delivery to the end of the year; while it is reported that 9d. naked has been realized in the Midlands for a twelve months' contract. 50-90 per cent. remains firm; but there is not much offering. On the east coast 11¾d. is being asked, and 1s. in London; but it is not reported that any business has been done at these prices. Solvent naphtha is still very firm. Manufacturers report having done business all over next year at good prices, and are not now inclined to sell except at a distinct advance. High-flash naphthas are also in strong demand. For ordinary quality for delivery all over next year 1s. 2d. is asked and has been paid, while for special qualities 1s. 3d. to 1s. 5d. is being asked. In toluol, the position remains unchanged; and there is really no alteration in price.

The average values during the week were: Tar, 15s. 6d. to 19s. 6d. Pitch, London, 30s. 6d. to 31s. 6d.; east coast, 30s. to 31s.; west coast, 29s. 6d. to 31s. Benzol, 90 per cent., 10¾d. to 10½d.; 50-90 per cent., 11¼d. to 11⅜d. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4½d.; solvent naphtha, 1s. 1½d. to 1s. 3d.; heavy naphtha, 1s. to 1s. 3d. Creosote, London, 2d. to 2⅛d.; North, 1½d. to 1⅝d. Heavy oils, 2¼d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Naphthalene, £4 10s. to £9 10s.; salts, 28s. to 33s. Anthracene, "A" quality, 1½d. to 1⅝d.

Sulphate of Ammonia.

The market has been steady in the past week, and prices have hardened slightly during the last day or two. London manufacturers ask £12 2s. 6d. to £12 5s.; but business could no doubt be done on Beckton terms at £12, or perhaps a little less. In Hull, the market is quiet; but £11 18s. 9d. has been paid for October delivery, and £12 for a small quantity of a fair make for delivery to the end of the year. In Leith, manufacturers are not inclined to sell at anything under £12 2s. 6d. for delivery this or next month. In Liverpool, business has been done at £11 18s. 9d., and £12 for prompt delivery.

Gas Testing at Aldershot.—The Aldershot Urban District Council have taken expert advice on the Gas Company's suggestion for the employment of a different burner for gas-testing purposes. In consequence, the Lighting Committee have recommended, and the Council have agreed, that no objection be made to the Company's application to the Board of Trade for the proposed adoption of the "Metropolitan" argand No. 2 burner, instead of Sugg's argand No. 1.

Salt Water for Streets.—A Local Government Board inquiry has been held at Redcar with reference to the desire of the Urban District Council to borrow £1400 to carry out a new scheme for flushing the streets with salt water. Mr. J. Howcroft, the Engineer and Surveyor, explained that the Council proposed to install an engine capable of lifting 6000 gallons of water per hour. Salt water is already used for street watering at Redcar; and the Council have had no complaints regarding it. There was no opposition.

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Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	50,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

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COAL TRADE REPORTS.

Lancashire Coal Trade.

Evidence is not wanting to show that there is a steady improvement all round in the various branches of the coal trade. Gas companies are everywhere asking for increased deliveries of coal and cannel to meet the larger consumption of gas for lighting and power purposes. House coal is in better request. Furnace coal also meets with a rather better demand. There has been no quotable advance in prices; but sellers are firm in exacting the full terms current. Engine slack is equally firm; commanding full prices, with slight advances for renewals of contracts for next year. Quotations are: Best house coal 13s. to 14s. per ton at the pits, seconds 12s. to 13s., common 9s. to 10s., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. to 7s., common 5s. to 6s. Coal for shipping, which has latterly shown some improvement in the export trade, is 9s. 6d. to 10s. 6d. Furnace coke is from 17s. to 24s.

Northern Coal Trade.

There is still considerable quietness in the coal trade of the North-East; and in the opinion of some judges it arises from the desire of buyers abroad to reduce their stocks before the expiration of the coal-tax. So that it may continue for some weeks yet. It is most marked in steam coal, in which best Northumbrian steams are quoted at from 10s. to 10s. 3d. per ton f.o.b., second-class steams being about 9s. 6d., and steam smalls 6s. to 6s. 3d. In the gas coal trade, the growth of the consumption is now more evident; and deliveries of the best gas coals on contract are now so heavy that there is only a small surplus for sale. The prices of best Durhams are firm at 10s. 6d. to 11s. per ton f.o.b.; while other qualities seem more plentiful relatively at from 9s. 9d. to 10s. 6d. One or two contracts for export are in the market, but are not expected to vary much from the current quotations. Coke is higher; and this, and a better foreign inquiry, has made gas coke decidedly firmer, so that good gas coke is from 12s. to 12s. 3d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

The market continues steady, but not strong; the remission of the coal-tax having the effect of retarding the placing of orders meantime. For the same reason, prices are, if anything, somewhat easier. The quotations are: Main 8s. 9d. to 9s. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s., and splint 9s. 6d. to 9s. 9d. The shipments of the week amounted to 298,841 tons—an increase of 16,851 tons upon the previous week, and of 35,733 tons upon the same week of last year. For the year to date, the total shipments have been 9,715,742 tons—an increase of 1,108,118 tons upon the corresponding period of 1905.

Last Tuesday, at the meeting of the Tottenham Urban District Council, it was reported that, the Gas Company's new Act having received the Royal Assent, tests for sulphur would now cease. There would, however, in future be tests for calorific power.

Municipal Housing and Electricity.

The annual report of the Municipal Housing Schemes in St. Pancras, which was issued last Wednesday, shows a deficiency on the twelve months' working of the Goldington Buildings of £164. The Committee, in explaining this loss, state that only £50 was received from tenants for electric current consumed; while £163 had been paid to the Electricity Department. In the nine months previous, £42 had been received from the tenants, and £80 paid to the Electricity Department. The discrepancy in these figures was partly due to the pre-payment meters not having been in thorough working order, and having been away at the makers' under repair; the tenants during this time paying an average sum for current consumed, and probably using more than the average quantity. The Committee propose to replace the slot meters by ordinary ones, and to require the Electricity Committee to undertake for the future the collection of the charges for current supplied.

Mid-Sussex Water Supply.

The Local Government Board having written to the Cuckfield Rural District Council enclosing copies of letters complaining of the unsatisfactory state of the water supply in the Mid-Sussex area, the Council instructed their Clerk on Saturday to inform the Board that the trouble was caused by the delay of the authorities at Whitehall in sanctioning the loan for new machinery; and that now the new machinery had been erected, no further trouble was anticipated this year. Recognizing that, owing to the rapidly-increasing consumption of water, a fresh source of supply is necessary, the Council propose to take the requisite steps to secure it. Sir Weetman Pearson, M.P., and Colonel Stephenson R. Clarke are to be asked for the terms of sale of land for boring. A sum up to £1000 is also to be spent on increasing the supply in the well at Balcombe during the winter; and the Council have also acceded to the request of the Haywards Heath and Cuckfield Urban Councils, who desire a voice in the management of the water-works, for the formation of a Joint Water Board on equitable terms.

Naphthalene Troubles at Oldham.—Complaints as to "bad gas" at Royton, which is supplied by the Oldham Corporation, are stated by Mr. Arthur Andrew, the General Manager, to be due to the presence of naphthalene in the pipes. He points out that the difficulty has been just as much felt in the borough as in the out-townships; 800 lamps having been out on one night. Mr. Tim Duxbury, the Works Manager, also says that the naphthalene trouble has been worse this year at Oldham than ever before; and that the experience of other towns has been the same. At present, efforts are being made to get rid of the naphthalene by the use of a solvent; and the Gas Committee have further determined to install "Livesey" washers.

RETORT IRON WORK

AND

SETTINGS.

WILLEY & Co., LTD.

ENGINEERS,

LONDON & EXETER.

Telegrams: WILLEY, EXETER.

A Water Scheme for the Belper District.—The Belper Rural District Council are considering a proposed water scheme to embrace several parishes. The cost is estimated at £13,900; and the parishes concerned are Morley, Smalley, Denby, Kilburn, Horsley, and Horsley Woodhouse—the outlay being divided in proportion to the rateable value. The water is to eventually come from the Derwent Valley source.

Guildford Water Supply.—It is reported that negotiations are at present in progress between the Guildford Corporation and the Woking Water Company for the acquisition of the latter's rights in a portion of the area which was added to the borough some two years ago. These rights the Corporation were empowered to purchase under the provisions of their Extension Order. The Company have intimated that they are prepared to accept the sum of £105,307; and the Corporation, after obtaining advice, have decided to offer the Company the sum of £18,700.

Prepayment Meter Law.—At the Tower Bridge Police Court, last Saturday week, Mary Deadman, who was charged with stealing 12s. 2d. from her prepayment meter, admitted taking the money, but said she found the meter unlocked, and was tempted. The Magistrate (Mr. Rose) said that automatic gas-meters could not be regarded exactly as human beings in receiving money. If by any chance this meter was left unlocked, and if the woman thought that the money she put in was not a final payment, and that she would put it back again, a Jury might say she had no felonious intent. Such an action might be considered like putting money on a shop counter, and taking it back again, which was different to putting it in a human hand. As he was inclined to believe the woman when she said she found the meter open, he discharged her with a caution.

Costs of the Torpoint Water Bill.—Subject to formal confirmation by the District Council, an agreement has now been arrived at for the settlement of the question of the costs of promoting the Torpoint Water Bill. It will be remembered that the scheme was taken up largely at the instance of the Admiralty; and that after its preparation there was a change of Admiralty policy, with the result that it failed to receive the support from the Government which would have ensured its endorsement by Parliament. The Bill was thrown out; and the District Council were saddled with costs amounting to £5754. The Admiralty agreed to pay £5000; and as to the balance an action was entered against the Council by Mr. Diggle, the Consulting Engineer. This has been settled on the terms that the Council should pay the amount of the debt—£754—with interest at 3½ per cent. on the principal money from time to time remaining due, by quarterly instalments of £40. The first payment is to be made on the 29th inst.; and the Council are also pay the costs of the action brought by Mr. Diggle, and £3 3s. towards the cost of preparing the agreement. So long as the payments are regularly made, Mr. Diggle agrees not to take any steps to enforce the judgment; but should the Council fail to do so, he will be entitled to put the judgment in force.

Lighting of Public Buildings at Tunstall.—The Tunstall Town Council are considering the question of the improved lighting of the Town Hall and market buildings. The Surveyor has been instructed to obtain information with regard to the lighting of the Town Hall by electricity, and to prepare alternative schemes for lighting the market hall by incandescent gas and electricity.

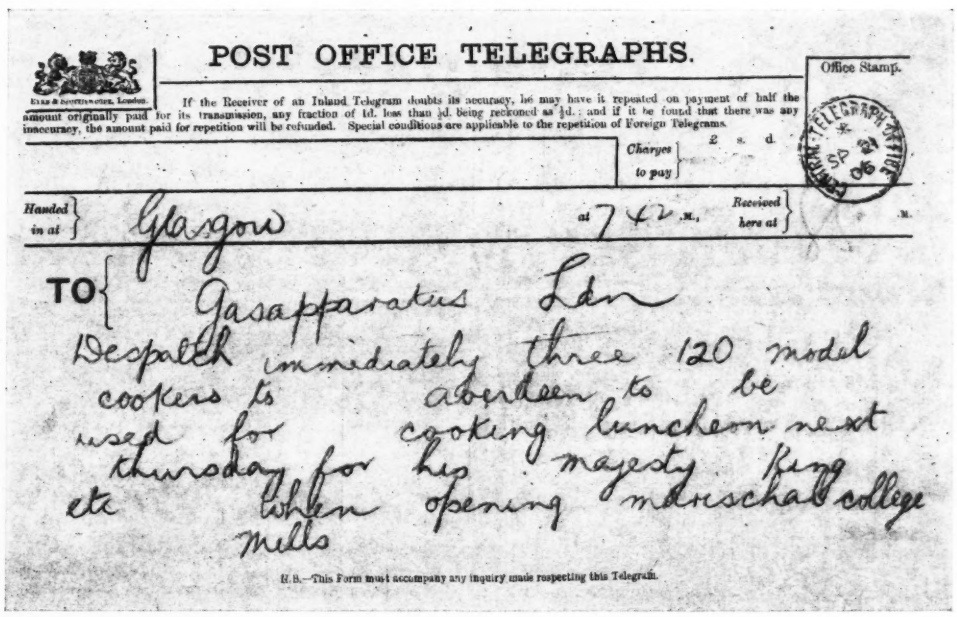
Suicide in a Reservoir.—It was stated in last week's "JOURNAL" that a man had committed suicide at Jersey by drowning himself in the Water Company's reservoir; and that if, in consequence of this, the reservoir had been emptied, it would have led to a water famine. The Engineer states, however, that the pond in which the man committed suicide contained only a few thousand gallons of water; and the question of emptying it was not thought of, as it was not necessary to use the pond. The body was recovered almost immediately.

Reporting a Fire at the Middlesbrough Gas-Works.—Councillor Roberts has been calling the attention of the Middlesbrough Fire Brigade Committee to what he called the "outrageous reports in the papers" on a fire which broke out at the gas-works. He said that in many respects the reports were very incorrect. Mr. Hanmer, the Superintendent, stated that he gave the particulars of the fire to the reporters; and the fire, from his experience, had assumed large proportions. A shed was alight from one end to the other; while the flames reached the roof. If the fire had only been slight, he would not have had to bring the steamer into use. The pipes underneath the building were also very hot.

Meter Explodes while being Tested.—As the result of a gas explosion at the Weights and Measures Offices, Hanover Square, Hull, several inspectors were more or less injured. Chief Inspector Crane Cooper and two assistants, Arthur Ralph and Alfred Willis, had just tested a meter belonging to the Beverley Gas Company, when it exploded, knocking Willis down and doing considerable damage. Mr. Cooper received severe contusions to his legs and hands, and was taken home in a cab suffering from concussion. Willis was taken to the Royal Infirmary and attended for a contused wound on the head and injury to the right leg. Ralph received an injury to his right eye, and his face was burnt and singed.

Charge for Public Lighting at Wisbech.—On the recommendation of the General Purposes Committee, the Wisbech Town Council have accepted the tender of the Gas Company for lighting the lamps throughout the year; the charge being £3 10s. 4d. each for incandescent lamps, and £3 6s. each for those with flat-flame burners, both less 5 per cent. The net additional cost will be only about £60 a year more than is now paid for season lighting. The acceptance of the tender was not agreed to without demur by the Council; one or two members being of opinion that better terms should have been secured. It was, however, pointed out by the Mayor that there was no alternative light to which to resort, and that they were therefore to a large extent in the hands of the Gas Company.

ON HIS MAJESTY'S SERVICE.



POST OFFICE TELEGRAPHS.

Office Stamp.

If the Receiver of an Inland Telegram doubts its accuracy, he may have it repeated on payment of half the amount originally paid for its transmission, any fraction of 1d. less than ½d. being reckoned as ½d.; and if it be found that there was any inaccuracy, the amount paid for repetition will be refunded. Special conditions are applicable to the repetition of Foreign Telegrams.

Charges to pay £ s. d.

Handed in at Glasgow at 7 42 M. Received here at M.

TO Gasapparatus Ldn

Despatch immediately three 120 model cookers to Aberdeen to be used for cooking luncheon next thursday for his majesty King etc when opening marischal college Mells

H.B.—This Form must accompany any inquiry made respecting this Telegram.

Advertisement of the RICHMOND GAS STOVE & METER CO., LTD.

London Offices and Show-Rooms: 132, Queen Victoria Street, E.C. General Offices and Works: Warrington, &c.

Reduction for Power Purposes at Burslem.—The Burslem Town Council have, on the recommendation of the Gas Committee, agreed to the following reduced scale of charges for the supply of gas for power purposes: Up to 25,000 cubic feet, 2s. 6d.; 25,000 to 50,000 feet, 2s. 5d.; 50,000 to 75,000 feet, 2s. 4d.; 75,000 to 100,000 feet, 2s. 2d. All the prices to be less 2d. discount.

Shrewsbury Gas Company's Assessment.—This Company, like many others, have had the question of their rating under the consideration of the Assessment Committee. The amount had not been revised for some years, and stood at £3557. The Directors, on the recommendation of their Engineer (Mr. William Belton), retained Messrs. William A. Valon and Son, and under their advice have secured an assessment limited to an additional £382; the present rateable value agreed to by them on behalf of the Company being £3939. Messrs. Marshall and Sons acted for the Assessment Committee.

Heywood and the Water Board Bill.—It was stated in the "JOURNAL" a few weeks ago that the Heywood and Middleton Water Board were arranging to promote a Bill next session to give them power to borrow £125,000 for the purposes of their undertaking. This money is required for the completion of the Ashworth Moor reservoir, in connection with which scheme between £160,000 and £170,000 has already been expended. When the proposal came before the Heywood Town Council, it was pointed out that the reservoir had cost much more than was originally estimated, because of the difficulty of securing a good foundation for the embankments, &c.; but it was urged that it was absolutely necessary to complete the work now that it had gone so far. On the other hand, however, it was contended that if it had been known that the reservoir would have cost so much, the work would not have been allowed to go forward. The scheme had been enlarged from time to time, until it had reached its present size. In the end, the discussion was closed on the understanding that the Board will furnish to the Council a report on the Bill.

Last Wednesday week, the first of a series of lectures, under the auspices of the Mytholmroyd Co-operative Education Department, was held in St. Michael's Church School. The lecturer was Mr. E. J. Wellens, the Manager to the Hebden Bridge and Mytholmroyd Gas Board, who took for his subject "Gas as an Illuminant." At its conclusion, Mr. Wellens was heartily thanked for his lecture.

At last week's meeting of the West Ham Education Committee, it was reported that during the vacation tenders to the aggregate amount of £894 had been accepted for improvements to gas-fittings in twelve schools. The tenders of the Sunlight Company, Mr. W. Taylor, and Messrs. Sugg and Co., were accepted for the supply of mantles, globes, chimneys, &c., rendered necessary by the installation of incandescent gas lighting.

The accounts of the Glenboig Union Fire-Clay Company, Limited (after providing for maintenance of works and for current charges), show, subject to completed audit, a gross profit of £32,663. The Directors have agreed to recommend that £6000 be applied in depreciation of capital expenditure, £5000 to the reserve fund, and £18,750 in payment of a dividend of 10 per cent., with a bonus of 2½ per cent., carrying forward £2913. For the previous year the dividend was 10 per cent., with £3938 carried forward.

At the Midland Hotel, Langley Mill, last Wednesday, the Directors of the Langley Mill and Heanor Gas Company entertained the workmen who have been engaged in constructing a large new holder, the Contractors for which were Messrs. Robert Dempster and Sons, Limited, of Elland. Those present included the Manager and Secretary of the Company (Mr. John Andrews). The Chairman of the Board (Mr. F. Tarr) complimented the firm on the speedy manner in which the work had been done, it being just three months since the first rivet was driven. The tank is 101 ft. 9 in. diameter and 20 ft. 6 in. deep; the holder being a telescopic one 100 feet diameter and 20 feet deep.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. No. 4654.
WORKING MANAGER. Tetbury Gas Company.
GAS-FITTER. Nantwich Gas Department.
GAS-ENGINE DRIVER. No. 4655.

As Representative in Australia.

W. G. Quicke, Perth, W. A.

Situations Wanted.

MANAGER (Gas or Gas and Water). No. 4656.
ASSISTANT SECRETARY, &c. "W.," Bush Hill Park.
SULPHATE OF AMMONIA PLANT REPAIRER. Firgeson, Warwick Road, S.W.
REPRESENTATIVE. No. 4650.
CHARGE OF SHOW-ROOM, &c. No. 4652.

Gas-Works Wanted on Lease.

No. 4646.

Plant, &c., Wanted.

EXPERIMENTAL GASHOLDERS. No. 4653.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. Oct. 16.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. Oct. 16.
DENBIGH WATER COMPANY. Nov. 1.
LOWESTOFT WATER AND GAS COMPANY. Oct. 16.
NORTHFLEET AND GREENHITHE GAS COMPANY. Oct. 16.
SOUTHEND WATER COMPANY. Oct. 16.

TENDERS FOR

Benzol.

RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by Oct. 2.

Conveying Machinery and Coal Breaker.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Hydraulic Plant — Tipping Machines, Lift, Capstan, &c.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Steam Engines, &c.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Tar and Liquor.

RADCLIFFE AND PILKINGTON GAS COMPANY. Tenders by Oct. 2.

Washer Scrubber.

SEDGLEY GAS DEPARTMENT. Tenders by Oct. 5.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 821.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
500,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
160,000	10	,,	7½	Do. 7 p.c.	14⅛—15½	..	4 16 9
200,000	5	May 11	7	Bomt ıy, Ltd.. . . .	6⅜—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅜	..	5 1 10
50,000	10	Aug. 30	14	Bourne-) 10 p.c. . .	28—29	..	4 16 7
51,810	10	,,	7	mouth Gas) B 7 p.c. .	16⅜—17½	..	4 1 3
53,200	10	,,	6	and Water) Pref. 6 p.c.	15½—16½	..	3 12 9
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9⅜	Do. New . . .	198—203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Mch. 9	11½	Brighton & Hove Orig.	234—239	..	4 14 2
246,320	,,	,,	8½	Do. A. Ord. Stk. .	167—172	..	4 15 11
460,000	20	Apl. 11	10	British	41⅞—42½	..	4 14 1
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	May 11	7	Buenos Ayres (New) Ltd.	12¾—12¾	..	5 9 10
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	June 14	10	Cape Town & Dis., Ltd.	15—16	..	6 5 0
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	9¾—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	98—100	..	4 10 0
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk. .	113—115	..	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	110—112	..	4 9 3
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6½	Continental Union, Ltd.	123—126	..	5 3 2
200,000	,,	,,	7	Do. 7 p.c. Pref.	140—145	..	4 16 7
432,070	Stk.	Aug.	5⅜	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,c90	10	July 27	11	European, Ltd. . . .	24—25	..	4 8 0
354,cc0	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas-) 4 p.c. Ord. . .	99½—100½	+½	4 7 7
2,600,000	,,	,,	3½	light) 3½ p.c. max. .	88—90	..	3 17 9
3,799,735	,,	,,	4	and) 4 p.c. Con. Pref.	108—111	..	3 12 1
4,193,975	,,	June 14	3	Coke) 3 p.c. Con. Deb.	86—88	..	3 8 2
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103*	..	4 17 1
82,500	,,	,,	6⅔	Do. do. 5 p.c.	118—121*	..	5 7 5
70,000	10	Apl. 11	11	Hongkong & China, Ltd.	20—21	..	5 4 9
940,000	Stk.	May 11	8	Imperial Continental .	186—189	−2	4 4 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
181,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c. .	120—125	..	4 16 0
£			p.c.				£ s. d.
561,000	Stk.	Aug. 30	10	Liverpool United A . .	230—232	..	4 6 2
718,100	,,	,,	7	Do. B . .	167½—169½	−1	4 2 7
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	June 28	5	Malta & Medn., Ltd. .	4⅛—4⅜	..	5 5 3
560,000	100	Apl. 2	5	Met. of) 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne) 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	May 31	3½	Monte Video, Ltd. . .	11½—12½	+½	5 12 0
1,675,892	Stk.	Aug. 15	4⅜	Newc'tle & G'tesh'd Con.	110—112	..	4 2 7
406,025	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13⅛—14⅛	..	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	151—154	..	5 3 11
60,000	5	Sept. 13	7	Ottoman, Ltd. . . .	5⅜—6⅛*	..	5 12 0
398,490	5	Apl. 26	7	Primitiva Ord. . . .	6¼—7¼	..	4 16 7
796,980	5	July 27	5	Do. 5 p.c. Pref. .	5—5½	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Apl. 26	7	River Plate Ord. . . .	12⅞—13⅛	..	5 5 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Mch. 28	8	San Paulo, Ltd. . . .	14⅛—14⅜	..	5 8 6
70,000	50	July 2	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	241—243*	+2	4 2 4
209,984	,,	,,	10	Do. B	241—243*	+2	4 2 4
523,500	,,	,,	10	Do. C	241—243*	+2	4 2 4
70,000	10	May 31	10	South African	16—17	..	5 17 8
6,350,000	Stk.	Aug. 15	5⅜	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	86—88	..	3 8 2
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. . .	123—126	..	3 19 4
112.533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord. . .	107—112	..	4 9 3
120,000	Stk.	Aug. 30	£½	Tottenham) A 5 p.c. .	125—130	..	5 0 0
388,020	,,	,,	5	and) B 3½ p.c. .	100—103	..	4 17 1
137,500	,,	June 28	4	Edmonton) 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10½—11	+½	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104—106	+3½	4 14 4
30,000	Stk.	Aug. 15	8	Wands-) A 5 p.c. . .	—	..	—
255,636	,,	,,	£½	worth) B 3½ p.c. . .	137—142	..	4 11 7
75,000	,,	,,	5⅜	and) C 3½ p.c. . .	113—115	..	4 17 5
79,416	,,	June 28	3	Putney) 3 p.c. Deb. Stk.	82—85	..	3 10 7
779,875	,,	Aug. 15	5⅜	West Ham 5 p.c. Ord. .	105—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103—106	..	3 15 6

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Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

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Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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ALSO
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Also TENDERS for the supply of the Company's requirements of BENZOL.
Particulars may be obtained from the undersigned, to whom Tenders must be delivered not later than Tuesday, the 2nd of October.

James Braddock,
Manager and Secretary.

Gas Offices, Radcliffe,
Sept. 20, 1906.

CORPORATION OF COVENTRY.
(Gas Department.)

COAL CONVEYORS, &c.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Manufacture, Supply, and Erection, at their Foleshill Works, of the following COAL CONVEYING PLANT:—
Two Gravity Bucket Conveyors, each about 830 feet long, and of a capacity of 40 Tons per hour.
Two Short Tray Conveyors, each about 36 feet long and of similar capacity.
One Large 4-Roll Coal Breaker of a capacity of 60 Tons large coal per hour.
High-Pressure Steam Engines for driving the Breaker and Conveyors.
One 15-Ton capacity Receiving Hopper, together with steel work, &c., for carrying Breaker, &c.
Drawings, Specification, and Form of Tender may be obtained on and after Wednesday, Sept. 26, and on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, endorsed "Tender for Coal Conveyors, &c.," must be delivered not later than Nine a.m. on Monday, Oct. 15.

Fletcher W. Stevenson,
General Manager and Engineer.

Gas-Works, Coventry,
Sept. 20, 1906.

CORPORATION OF COVENTRY.
(Gas Department.)

HYDRAULIC PLANT.

THE Gas Committee of the Coventry Corporation invite TENDERS for the Manufacture, Supply, and Erection, at their Foleshill Works, of the following HYDRAULIC PLANT:—
Two Waggon-Tipping Machines.
One Direct-Acting Hydraulic Lift.
Two 1-Ton Capstans and Snatch Heads.
One set of High-Pressure Steam Pumps.
One Accumulator, &c.
Connecting Pipes, Valves, &c.
Drawings, Specification, and Form of Tender may be obtained on and after Wednesday, Sept. 26, and on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.
The Committee do not bind themselves to accept the lowest or any Tender.
Sealed Tenders, addressed to the Chairman of the Gas Committee, Gas-Works, Coventry, endorsed "Tender for Hydraulic Plant," must be delivered not later than Nine a.m. on Monday, Oct. 15.

Fletcher W. Stevenson,
General Manager and Engineer.

Gas-Works, Coventry,
Sept. 20, 1906.

ROTARY WASHER-SCRUBBER.

THE Sedgeley Urban District Council invite TENDERS for Supplying a ROTARY WASHER SCRUBBER capable of dealing with 250,000 Cubic Feet of Gas per day, such Scrubber to be delivered, erected, and completed for use, at the Gas-Works, Lower Gornal.
The necessary Particulars may be obtained on application to the Engineer at the Works.
Sealed Tenders, marked "Washer-Scrubber," must reach me not later than the first post on the 5th of October, 1906.
The Council do not bind themselves to accept the lowest or any Tender.

Joseph Smith,
Clerk.

26, High Holborn, Sedgeley,
Sept. 22, 1906.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.
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MR. ALFRED RICHARDS will Sell the ABOVE BY AUCTION, at the Mart, E.C., on Tuesday, Oct. 16, at Two o'clock, in Lots.
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NEW ISSUE OF 400 £10 ADDITIONAL ORDINARY SHARES,
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SOUTHEND WATER-WORKS COMPANY.

1000 £10 NEW ORDINARY FIVE PER CENT. MAXIMUM SHARES.

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Particulars and Conditions of Sale and Forms of Tender may be obtained on application to the Secretary.
Tenders to be delivered on or before Twelve o'clock noon on Thursday, the 1st day of November next.

W. Ewart Brock,
Secretary.

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